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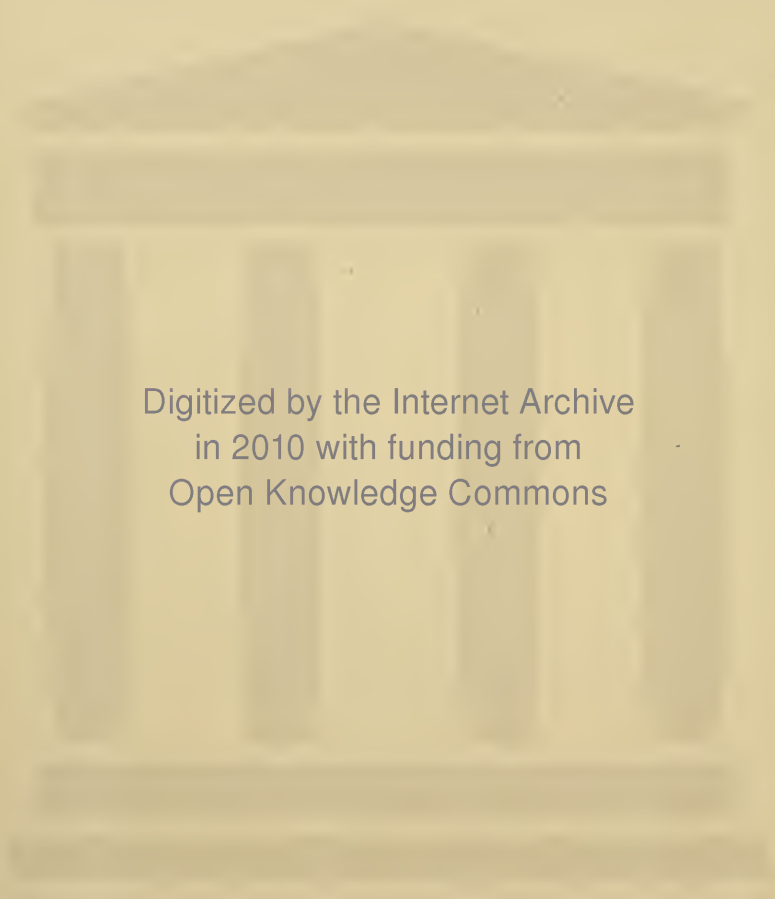
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TWENTY-FIRST ANNUAL REPORT

OF THE

# State Board of Health

OF THE

STATE OF OHIO

FOR THE

Year Ending December 31, 1906.



COLUMBUS, OHIO:  
F. J. HEER, STATE PRINTER,  
1907.





## LETTER OF TRANSMITTAL.

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OHIO STATE BOARD OF HEALTH,  
OFFICE OF THE SECRETARY.

COLUMBUS, February 28, 1907.

*To His Excellency, ANDREW L. HARRIS, Governor of Ohio:*

SIR:—In accordance with Section 8 of an "Act to create and establish a State Board of Health," as amended May 7th, 1902, the accompanying report, which is for the calendar year 1906, is herewith submitted:

Respectfully,

C. O. PROBST, M. D.,

*Secretary.*

(3)

## MEMBERS OF THE OHIO STATE BOARD OF HEALTH.

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*W. C. CHAPMAN, M. D., <i>President</i> , Toledo.....	December, 1906
JOSIAH HARTZELL, Ph. D., <i>Vice-President</i> , Canton.....	December, 1907
DARWIN G. PALMER, M. D., Geneva.....	December, 1908
BYRON STANTON, M. D., Cincinnati.....	December, 1909
J. C. CROSSLAND, M. D., Zanesville.....	December, 1910
WM. T. MILLER, M. D., Cleveland.....	December, 1911
FRANK WARNER, M. D., Columbus.....	December, 1912
C. O. PROBST, M. D., <i>Secretary</i>	

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\* Dr. W. C. Chapman was reappointed.

## GENERAL REPORT.

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This is the twenty-first annual report of the State Board of Health, and is for the year ending December 31, 1906.

### PERSONNEL OF THE BOARD.

There has been no change in the personnel of the Board since the last report. The term of Dr. W. C. Chapman, of Toledo, having expired December 13, 1906, he was reappointed by Governor Harris, for a term of seven years.

### MEETINGS.

Four regular meetings and one special meeting of the Board were held during the year, the proceedings of which are given farther on.

The sixteenth annual conference of the State and local boards of health was held in Columbus in January, and the papers and discussions were printed in the *Ohio Sanitary Bulletin*, and ten thousand copies of it were distributed.

### EPIDEMIC DISEASES.

There was no unusual prevalence of any of the epidemic diseases during the year. A few cases of smallpox appeared here and there, but there was no serious spread of the disease. It is probable that the general vaccination, brought about by the wide prevalence of smallpox a few years ago, has given us temporary protection. The neglect of systematic vaccination will gradually withdraw this protection and we may expect trouble from this disease in the future.

### DIPHTHERIA.

This heretofore very fatal disease of childhood has been largely conquered by antitoxin. A bill was passed by both branches of the last Legislature authorizing local boards of health to furnish antitoxin free for indigent persons suffering from this disease. By the carelessness of a clerk it was not presented to the presiding officers for signature, and therefore failed to become a law.

The attorney-general was asked for an opinion as to whether boards of health, under general powers authorizing them to enforce such measures as they deem necessary to prevent contagious diseases, could not supply antitoxin at public expense for use in indigent cases of diphtheria. It was thought this might be done upon the grounds that it lessened the

period during which a person having this disease was dangerous to others, and that when given to those exposed to diphtheria, it usually prevented them from taking it. He opined that boards of health did have such authority under existing laws.

Accordingly arrangements were made by the State Board of Health to keep constantly on hand a supply of antitoxin to be sent to boards of health upon their order for use in indigent cases. A specially low price was secured for antitoxin to be used for this purpose. The State Board of Health has nothing to do with collections and is not responsible for antitoxin so distributed, the manufacturers assuming all responsibilities, and paying, also, all expenses for distribution.

This arrangement has been in effect only a few months, but good results have already been noted, and the plan has met with much approval from the local health authorities.

#### PUBLIC WATER SUPPLIES.

The year has witnessed a very encouraging growth in the introduction of public water supplies. This means improved conditions as regards that very important health factor — pure water.

The Board has made careful investigation of all proposed water systems to ascertain purity of the supply before approving plans for the same.

The following places presented plans for a public water supply, a private (well) supply having been in use theretofore: Crooksville, Garrettsville, Leesburg, Plymouth and West Milton.

Plans for a change from an old to a new public water supply were presented by the following places: Akron, Canal Fulton, Ironton, Leetonia, Medina, Newark, Steubenville, Wauseon and Wooster.

All of our cities, sixty-nine in number, (communities of 5,000 population or over) have public water supplies. The combined population of these (Census of 1900) is 1,804,139.

Following is a list of cities now using unpurified water of surface origin: Akron, Alliance, Ashtabula, Bellaire, Cambridge, Cincinnati, Cleveland, Columbus, Defiance, East Liverpool, Glenville, Ironton, Lima, Martins Ferry, Norwalk, Piqua, Portsmouth, Sandusky, Steubenville, Toledo, Wellston, Wellsville, Wooster and Zanesville.

The combined population of these cities equals 1,239,689. Bellaire, Cincinnati, Columbus and Ironton, with a combined population of 472,242 (1900) have purification works under way.

The following cities and villages now have water filtration works: Batavia, Bucyrus, Conneaut, Dennison and Uhrichsville, Elyria, Fostoria, Geneva, Lorain, Marietta, Newark, Oberlin, Pomeroy and Middleport, Rocky River, Upper Sandusky, Vermilion, Warren and Youngstown.

Their combined population equals 160,255.

When filtration works now under construction are completed Ohio will have a population of about one million supplied with filtered water.



The question of water filtration is a most important one in this state. As previously pointed out in these reports, all of our large cities and many of the smaller ones must depend upon lakes and streams for water. All these sources of water supply are already more or less polluted. It will be hard with increasing population to hold this pollution in check. Every effort should be made to do so by more rigid requirements for the purification of sewage and other liquid waste products which must of necessity reach our surface waters. In spite of this, however, we should look forward to the time, and at no distant future, when practically all municipal water supplies taken from surface waters must be purified.

The subject of water filtration, which has not yet reached final settlement, is therefore deserving of the most serious consideration.

The last Legislature, having this matter in view, directed the State Board of Health to make a careful investigation of all plants in Ohio designed for the purification of water or sewage. A special appropriation was made for that purpose. The investigation has been going on for a year and some important facts in regard to both water and sewage purification have already been developed.

It is not the intention to discuss this work at this time. The results will be presented to the Legislature at its next meeting. It may be said now, however, that it has been abundantly shown that supervision of the plans for such works does not give sufficient protection to the public health. The operation of such plants is of equal importance to their proper construction. It would seem to be a proper function of the State to provide for the inspection and control of all municipal water filtration plants as neglect or incompetence in their operation may greatly endanger the public health.

A bill introduced in the last Legislature by Mr. Bense, of Ottawa County, considerably enlarges the powers of the State Board of Health in relation to water supplies and sewerage systems. The bill was recommended for passage by the Committee on Cities, but did not reach a vote before adjournment. The measure is therefore still pending.

#### SEWERAGE AND SEWAGE PURIFICATION.

During the year the Board has passed upon plans for sewerage and sewage purification for the following places:

Barberton, The Stirling Consolidated Boiler Company at Barberton; The Interstate Engineering Company, at Bedford; Cambridge, Chardon, Chillicothe, Columbiana, Conneaut, Covington, Cuyahoga Falls, Lakewood (Maplecliffe); Lancaster, Louisville, Lowellville, Marietta (Country Club), Massillon State Hospital, Medina, Mineral City, The West Vernon Land Company, at Mt. Vernon; New Bremen, Norwalk, Oberlin, Oxford, Pleasant Ridge (The Country Club of Cincinnati), Plymouth, Ravenna, Rising Sun, The Mennonite Old Peoples' Home near Rittman; Rockford,

Salem, Sandusky, Steubenville, Toledo, Warren, West Jefferson, Willoughby, Youngstown (Woodcrest) and Zanesville.

#### LOCAL NUISANCES.

A most vexatious subject is the maintenance of local nuisances. They exist everywhere — in the city, in the village, in the township — and not only in Ohio but in other states and, as shown by health reports, in practically all countries.

In the great majority of cases the nuisance consists of organic refuse of some character that is undergoing putrefactive changes and thereby creating offensive odors. All dead organic matter must finally be returned to the earth and re-enter the mineral kingdom. It requires constant care and watchfulness to have all these refuse matters inoffensively disposed of in a populous state. The privy and cesspool become filled and foul. The ill-kept stable, dairy, pig-pen, hen-house or swill-barrel arouse neighborhood dissatisfaction. Dirty slaughter houses, uncared for dump grounds, unburied carcasses, create offensive conditions.

Thousands of complaints against nuisances of this character have reached the State Board of Health in the twenty years of its existence. Appeals for protection are received weekly. If it devolves upon the State Board of Health to abate all these nuisances it would require one or more agents in every county, and its attention would have to be almost entirely devoted to such matters.

As stated, similar conditions are to be found throughout this country. The question of having the State deal with such local matters was thoroughly considered at a conference of all the State Boards of Health of the United States and Canada. It was unanimously agreed that this would not be wise or expedient.

The State should see to it that ample power is given to the local authorities to promptly abate all nuisances detrimental to either health or comfort. It should, through its State Board of Health, act in an advisory capacity, pointing out legal or other remedies, supplying information, and, where necessary, assisting in investigations to determine the facts.

Ohio has done all this and more. It has given almost autocratic powers to the local authorities. They may abate any nuisance, furnishing labor and material where necessary, and the expense becomes a lien upon the property and must be paid. Furthermore, it has provided for a board of health in every nook and corner of the state, and made it an express duty of such boards to abate all nuisances within their jurisdiction. The State Board of Health has rendered all possible aid to the local authorities whenever requested to do so.

But the nuisances remain — thousands upon thousands of them. It is questionable whether these conditions can be removed by law. It must be, after all, largely a matter of education. The creation of a neighborly sentiment in favor of the Golden Rule.

But law, or rather the enforcement of proper conditions by aid of the law, could, no doubt, greatly improve matters and at the same time help to educate the people and create a public sentiment in favor of decency and cleanliness. A successful prosecution in such cases may educate an entire community to respect the rights of others. Ten years and more ago a board of health in one of our cities ordered that no hogs should be kept within the corporation. A wealthy attorney, able to defend himself, was the first person to be prosecuted for violating this order. A determined resistance was made but the board of health prevailed. This not only forever after kept the hogs out of this city, but, the proceedings in the case being printed and sent to all boards of health, it led to the expulsion of the hog from many other communities.

The continuance of these local nuisances contrary to law, especially in villages and rural districts where they mostly prevail, is often due to the fact that the health officer who should enforce the law is unwilling to risk making enemies for the trifling sum paid him for his services. Twenty-five to thirty dollars a year is frequently the whole pay of the health officer. If it is a rich hog (of the human kind) who is maintaining the nuisance, the health officer also being human, may shirk his responsibility where there is so little at stake as his salary. Furthermore, a stinking hog-pen, for example, is quite circumscribed in its effect. A half dozen families at most may suffer from it and other members of the community care little or nothing about it. In many places most of the people are habituated to unsanitary conditions that are intolerable to but the few who have, perhaps elsewhere, been educated to different ideas. Should one of the latter complain the general sentiment of his community would be against him; and prosecution by jury trial result in defeat for the health officer.

It is probable that these local causes of ill health and discomfort could be removed to a very considerable extent if some one other than a strictly local officer were charged with the duty of enforcing the nuisance laws; and especially if such officer were given something like adequate compensation and were free from political control. Such an officer is contemplated in the recommendation of the Board in its last annual report that a county health officer be appointed for each county. This would not mean the abolishment of the local health officers already provided for, they would remain, but would be to some extent under the jurisdiction of the county health officer and would be aided by him, when necessary, in the enforcement of necessary sanitary regulations. The county health officer would be removed from local influences and would be much more apt, under the direction of the State Board of Health, to hold violators of health regulations to strict account.

The Board would renew its recommendation that the Legislature provide for county health officers, who should be given a reasonable compensation for services required, and some assurance of continuance in office as long as they properly discharge their duties.

## CONFERENCE OF THE STATE AND LOCAL BOARDS OF HEALTH.

The last Legislature provided by law that each city, village, and township should send a delegate to annual conferences called by the State Board of Health, and that the latter might divide these conferences as it deemed advisable. It is believed that this measure will be of much benefit to boards of health, and thereby to the communities they serve. It has been decided to call together for the first conference, representatives of boards of health of municipalities of 3,000 inhabitants and over.

The year passed, it is believed, has seen the foundations laid for further improvement in health conditions. Communities in general are cleaner and healthier than they ever were before. The people are beginning to recognize that sanitation must have a prominent part in advancing civilization if man is to enjoy its blessings to the full. We would hasten the day when health will be more sought for than wealth.

# MINUTES OF BOARD MEETINGS.

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Secretary's Quarterly Reports.

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## JANUARY MEETING.

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A regular meeting of the State Board of Health was held at the office of the Secretary, January 17, 1906, at 8 P. M.

All members were present except Dr. Crossland.

Professor Herbert Osborn of the Ohio State University, addressed the Board in regard to a bill that had been prepared to provide for a Natural History Survey of Ohio.

On motion of Dr. Miller, it was voted to refer the bill to a committee of three, to investigate and report.

Mr. E. G. Bradbury, as consulting engineer, with a delegation of six citizens from Norwalk, appeared before the Board and presented a proposition for establishing a system of sewerage and outlet for that city.

Messrs. Hall and Kuhn, of Botkins, presented the matter of an alleged nuisance in that village, arising from the improper construction of a storm water sewer by the county commissioners.

Colonel Charles B. Hart and others, addressed the Board in regard to a proposition to take water from Jonathan's Creek for the purpose of supplying the villages of Roseville and Crooksville. No definite plans had been prepared but the applicants especially desired to know if filtration would be required by the State Board of Health.

These matters were referred to executive session.

The minutes of the last meeting were then read and approved.

The Secretary presented his quarterly report which was approved and ordered filed for publication.

The Secretary presented a report of an investigation of the water supply of Covington, especially as regards an emergency intake, which had been constructed without the approval of the Board.

It was moved by Dr. Palmer, and seconded by Dr. Miller, to allow the infiltration well in Stillwater River, to be used in case of an emergency, to remain, but only upon the condition that the valve controlling it be locked, and the key kept in the possession of the health officer of Covington, and further, that water from such intake be used only with the knowledge of this official, whose duty it shall be to warn consumers to boil the water whenever such intake is used.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

The Secretary presented a report of an investigation by the engineer

upon the progress of construction and installation of a new water supply for the city of Newark. It was shown by the investigation that the city is not fulfilling one of the conditions of the approval of said water supply by the State Board of Health, namely: "That a filtration plant be included in the construction of the first portion of the proposed work."

On motion of Dr. Miller, seconded by Dr. Warner, it was voted that the Secretary be instructed to notify the board of public service of Newark that the Board would expect compliance with its former conditions of approval of the public water supply, and that the Board disapproves and will resist the admission of unfiltered water into any water mains for either fire or domestic purposes.

The Secretary presented a report by the engineer of an investigation of the sewage purification plant at Westerville. The investigation developed that the plant had not been used for some time and that untreated sewage was being discharged into Alum Creek, which would constitute a menace to the water supply of Columbus when, as has frequently been the case, it becomes necessary to supplement the supply of that city by taking water direct from the stream.

On motion of Dr. Warner, seconded by Dr. Miller, the Secretary was instructed to refer this matter to the Attorney General and ask his assistance in compelling the village to make proper use of its sewage purification plant.

The Secretary presented a letter from the President of the Ohio Interurban Railway Association, also letters from the attorneys for the Western Ohio Railway Company, requesting the Board to take some action to prevent spitting in interurban cars. He reported that the matter had been referred to the Attorney General for an opinion as to the authority of the State Board of Health to adopt such an order and read an opinion from the Attorney General in regard thereto in which it was held that the State Board of Health had such power and could require local health authorities and other officials to enforce it.

The Secretary presented the following draft of an order in regard to the matter.

#### AN ORDER OF THE STATE BOARD OF HEALTH TO PREVENT SPITTING ON RAILWAY AND INTERURBAN CARS.

It is hereby ordered by the State Board of Health of Ohio:

SECTION 1. That it is hereby declared dangerous to the public health, and a nuisance and unlawful, for any person to spit or expectorate upon the floor, seat or wall of any steam or electric car, or upon the floor, seat or wall of any steam or electric railway station, except in proper receptacles provided therefor.

SECTION 2. It shall be the duty of the owners or managers of all steam and electric railways operated in whole or in part in the state of Ohio to post a copy of this order in a conspicuous place, in each passenger car and station owned or controlled by said railways; provided that this act shall not apply to steam or electric

cars operated wholly within the boundaries of any municipality, nor to stations used exclusively for cars so operated.

SECTION 3. Whoever violates this order is liable to a penalty of not to exceed one hundred dollars. (See Sec. 2119, R. S.)

Section 409-25 Revised Statutes of Ohio:

"It shall be the duty of all local boards of health, health authorities and officials, officers of state institutions, police officers, sheriffs, constables, and all other officers and employes of the state, or any county, city or township thereof, to enforce such quarantine and sanitary rules and regulations as may be adopted by the state board of health, and in the event of failure or refusal on the part of any member of said board or other officials, or persons in this section mentioned to so act, he or they shall be subject to a fine of not less than fifty dollars, upon first conviction, and upon a conviction of second offense of not less than one hundred dollars."

On motion of Dr. Warner, seconded by Dr. Miller, the Board voted to adopt this order and the Secretary was instructed to take the necessary steps to have it put in force.

The Secretary presented a bill, which had been prepared by the engineer with his approval, authorizing the State Board of Health to make an extended investigation of all water and sewage purification plants in the state, and asking for an appropriation of \$15,000 for such work.

On motion of Dr. Miller, seconded by Dr. Warner, the Board voted to adopt and urge the passage of the bill.

The sanitary policeman of Warren presented a communication from the city engineer, in regard to the approval of additional sewerage for the city of Warren. The matter was referred to the engineer for investigation and report.

The Board then went into executive session.

It was moved by Dr. Stanton and seconded by Dr. Miller to disapprove the plan of Norwalk to discharge unpurified sewage into the East Branch of the Huron River.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

The question of a nuisance at Botkins, arising from the improper construction of a sewer, was taken up, and on motion of Dr. Stanton the Secretary was instructed to refer the matter to the Attorney General for advice as to what action should be taken.

The proposition to supply water to Roseville and Crooksville was taken up.

On motion of Dr. Warner, seconded by Dr. Miller, the Board decided that it would be necessary to filter the water supply proposed for these villages.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

The Secretary presented a report by the engineer of an examination of the water supply of West Milton, which showed that the village had abandoned as a source of public water supply the Vore Spring, approved by the State Board of Health in October, 1902; that upon the failure of this spring the village made use of a small surface stream called Rutledge Branch, and for the last six months or more use had been made of a spring located beneath the residence of P. J. Haskett, known as Haskett Spring. No notice or application for approval of the use of Rutledge Branch or Haskett Spring was ever made to the Board and on account of the surroundings of this spring, there being a privy and stable near to it, the spring was unsuitable and liable at any time to become unsafe for a public water supply.

It was moved by Dr. Stanton and seconded by Dr. Warner to disapprove this spring, known as Haskett Spring, as a source of supply and to order its use discontinued, and to advise that a new supply should be sought for at once, satisfactory to the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

The Secretary presented a list of health officers, who had been appointed by council in lieu of a board of health and vouched for by five property holders of their respective villages.

It was moved by Dr. Miller, and seconded by Dr. Stanton to approve this list of health officers.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

Matters previously acted upon by mail were taken up for confirmation as follows:

On motion of Dr. Stanton, seconded by Dr. Palmer, it was voted to confirm the action of the Board approving a proposed 8-inch storm sewer, 500 feet long, in South William Street, Paulding, with outlet into Flat Rock Creek near the foot of said street, provided that the council of Paulding first pass an ordinance and file a copy thereof with the Secretary of the State Board of Health, forbidding the tapping of this sewer for the purpose of admitting household wastes of any kind: Also advising the village that the discharge of the sewage into Flat Rock Creek below town was creating a nuisance and that provision for purifying this sewage should be made as soon as possible; that all new sewers should be of the type best adapted for use in connection with sewage purification works, and that they should be so constructed that all sewage from the village can be collected at one point.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.



On motion of Dr. Miller, seconded by Dr. Stanton, it was voted to confirm the Board's action approving the plans for a sewage purification plant for the tuberculosis hospital of the Cleveland Farm Colony at Warrensville, as shown upon drawing dated October 26, 1905, and submitted by Mr. A. J. Galvin, assistant engineer of sewers and drains, Department of Public Service of Cleveland on November 7, 1905, provided that the size of this plant be increased as deemed necessary by the State Board of Health and that the methods of operation be at all times subject to the approval of the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

On motion of Dr. Warner, and seconded by Mr. Hartzell, it was voted to confirm the action taken by the Board in regard to plans for proposed sewerage for Sewer Districts No. 41 and No. 42 of the city of Toledo, as shown upon drawings submitted by the city engineer, Mr. F. I. Consaul, on October 25, 1905, which was as follows:

To approve the proposed sewerage for that portion of District No. 41 which, according to the plan submitted, is to discharge through an outlet to be located on the east bank of Swan Creek a few hundred feet north of the Western Avenue Bridge, provided that the dry weather flow, at least, be discharged through a submerged pipe, and that whenever this outlet becomes a nuisance, in the opinion of the State Board of Health, provision shall immediately be made for disposing of the sewage being discharged thereat in a manner satisfactory to said Board.

To postpone approval of the proposed 24-inch outlet for the northerly part of this district until this outlet is needed and plans for its construction have been definitely made.

To approve the proposed sewerage for sub-district No. 1, of the main sewer district No. 42, provided that the outfall sewer for this sub-district be extended down the Ottawa River to a point well beyond land which is to be used for park purposes and that the dry weather flow, at least, be discharged into deep water through a submerged outlet; and provided also that whenever this outlet becomes a nuisance, in the opinion of the State Board of Health, provision shall immediately be made for disposing of the sewage being discharged thereat in a manner satisfactory to the State Board of Health.

To postpone approval of the proposed 36-inch outlet for the northerly portion of this district until this outlet is needed and the plans for its construction have been definitely made.

The opinion of the Board was expressed in regard to the poor design of the present sewerage system, in general, and especially those districts bordering on Swan Creek and the Ottawa River and the city was advised, for the sake of efficiency and economy, to build future sewers on the separate plan.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

On motion of Mr. Hartzell, seconded by Dr. Stanton, it was voted to confirm the action of the Board disapproving the outlet for the 18-inch tile sewer in Elyria Street, North Amherst, discharging into Beaver Creek, and to notify the village authorities that the discharge of unpurified sewage into Beaver Creek must cease by September 1, 1906; also to advise the authorities that a proper sewerage system with purification works should be installed at the earliest possible time, and that plans for such works should be submitted to and receive the approval of the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

On motion of Dr. Stanton, seconded by Dr. Palmer, it was voted to confirm the Board's action approving the location and outlet of the sewer in Center and South streets, Huron, as submitted by S. M. Glenn, Jr., superintendent of schools, on November 28, 1905, provided the outlet be so constructed that the sewage will be discharged below the surface into deep water: and to disapprove their plan to make this a combined sewer.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

On motion of Dr. Palmer, seconded by Dr. Warner, it was voted to confirm the action of the Board approving plans for a proposed new filter plant for the city of Lorain, as shown on drawings submitted to the Board by the Pittsburgh Filter Manufacturing Company on September 7, and October 28, 1905, provided that the management and operation of the plant, the use of the coagulant, and the method of controlling the rate of filtration be subject at all times to the approval of the State Board of Health; also to call the attention of the authorities to the fact that the present and proposed facilities for storing filtered water were not sufficient to allow for any considerable increase in the water consumption, and that unless greater storage capacity were provided the new filter plant, as in the case of the old one, would within a few years be operated at excessive rates at times and poor results would be obtained.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

On motion of Dr. Warner, seconded by Dr. Miller, it was voted to confirm the Board's action approving the plans for a proposed water supply for the village of Struthers and nearby factories and railroads, as shown upon drawings submitted November 7, 1905, by Mr. James J.

McNally, secretary of the Mahoning Valley Water Company, and as described in the application accompanying the plans, provided:

1st. That the board of trustees of public affairs of the village of Struthers adopt rules and regulations for the protection of the purity of the water in the proposed reservoir; such rules and regulations to be satisfactory to the State Board of Health and similar to those already compiled by the State Board of Health for certain villages in Ohio:

2nd. That the Mahoning Valley Water Company employ an inspector, whose duty it shall be to inspect the watershed of the reservoir at least every month, and to note and so far as possible to correct any violation of said rules and regulations; and also to note all cases of typhoid fever and other intestinal diseases existing upon the watershed; and to provide for special care to be taken to prevent any possibility of excrement from such patients reaching any water course leading to Yellow Creek.

3rd. That said inspector report immediately to the board of trustees of public affairs of Struthers, with request for legal action, any case where willful or continued failure to comply with the said rules and regulations exists; and,

4th. That the Mahoning Valley Water Company install a filtration plant, satisfactory to the State Board of Health, to purify at least that portion of the supply which is used for domestic purposes, whenever in the opinion of said Board this becomes necessary.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

On motion of Dr. Warner, seconded by Mr. Hartzell, it was voted to confirm the action of the Board approving the proposed source of a public water supply for Loveland, to be obtained from wells designated as No. 1 and No. 2, and located upon an island near the northerly corporation line of Loveland, as shown upon a drawing submitted on December 22, 1905, by The H. C. Hubbell Company, provided that no other wells be used in connection with the public supply unless the use of such other wells have first received the approval of the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

On motion of Mr. Hartzell, seconded by Dr. Stanton, it was voted to confirm the action of the Board taken in reference to an additional water supply for Leetonia, to be derived from driven wells, as follows:

To approve the use of the two wells known as No. 1 and No. 2, located near the present water-works pumping station, provided that no source of pollution which, in the opinion of the State Board of Health, might influence the quality of the water be allowed within 500 feet of these wells.

To disapprove the use of water from the small tributary of Cherry

Fork as a source of public water supply, and to notify the authorities that the use of this stream should be discontinued at once and all connections by means of which this water could be used in the village supply should be destroyed.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

On motion of Dr. Miller, seconded by Dr. Stanton, it was voted to confirm the actions approving health officers, in lieu of a board of health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

Attest.

C. O. PROBST.

*Secretary.*

## QUARTERLY REPORT OF THE SECRETARY.

JANUARY MEETING, 1906.

*Mr. President and Members of The Ohio State Board of Health,*

GENTLEMEN :—Your Secretary begs leave to present the following report :

Since our last meeting, October 25, 1905, there have been 68 cases and no deaths from smallpox reported. The disease, so far as known, now exists in but five places, Cincinnati, Dayton, Van Buren Township, Montgomery County, Licking Township, Muskingum County, and Dillonvale. The greatest number of cases were reported from Dillonvale, where they have had eighteen cases.

But two investigations have been made on account of smallpox. October 31st Dr. Moninger visited Vinton, Gallia County; and December 23rd Dr. Heinlein visited Dillonvale.

November 20th, Dr. Platter investigated an outbreak of diphtheria at Thornville; December 5th, an outbreak of scarlet fever and diphtheria at Niles; and December 13th, an outbreak of scarlet fever in Clermont County.

The bacteriologist investigated an outbreak of typhoid fever at Irondale; and visited New Philadelphia to locate the source of bad odors and the detrimental effect that was being produced upon the paint on many of the houses. The source of the trouble was located in burning gob-piles connected with coal mines in the neighborhood, and a report was made to the local health authorities as to the cause and remedy.

Dr. Warner visited Chillicothe to determine whether it would be necessary at this time to require them to build sewage disposal works, the approval of this board having been given upon the condition that such works would be installed when deemed necessary by the Board. Dr. Warner reported that in his judgment there was no reason at this time for requiring Chillicothe to purify its sewage.

The following places were visited by the engineer: Bratenahl, Carrollton, Hiram, Huron, Lorain, Marion, Nevada, North Amherst, Paulding, Toledo and Cleveland to investigate proposed sewerage improvements.

Byesville was visited by the engineer in reference to the pollution of a ditch and an epidemic of typhoid fever alleged to have resulted therefrom. A report of the investigation was sent to the mayor and council with a letter of advice.

Upon the request of the health officer, the water supply of Carrollton



was investigated by the engineer. A report was made and sent to the health officer with a letter of advice.

The engineer also visited Marion to inspect the new sewage and refuse disposal plant. He found that the plant was not being operated in a manner to insure permanent efficiency. A letter was sent to the authorities with directions for making certain changes in the operation of the plant, and they were informed that when these had been made the Board would make a thorough examination and compile a set of rules and regulations for the future operation of the plant. They replied that the changes would be made at once.

Upon request of the village clerk of Bratenahl, the engineer visited that village and reported upon the pollution of certain streams in the village. A copy of the report was sent to the board of public service of Cleveland, having charge of the sewage disposal plant at Glenville, calling attention to the fact that the plant had not been built in accordance with the original plans approved by the State Board; that its present capacity was not great enough to purify the sewage being discharged at the plant, and, that the effluent from this plant was creating very offensive conditions in and along Dugaway Brook. They were notified that the size of the plant should be increased so that it would be capable of satisfactorily doing the work required of it.

A copy of the report was also sent to the board of trustees of public affairs of East Cleveland, and their attention was called to the pollution of Shaw Brook below the outlet of their sewage disposal plant and to the fact that the investigation showed that this plant was not capable of purifying in a satisfactory manner the amount of sewage being discharged thereat. They were also advised that several houses which had private drains leading into the brook should be connected with the village sewers as soon as possible.

The health authorities of Cleveland were also notified that they should enforce the necessary sanitary regulations to prevent the placing of refuse in Spring Brook.

The health officer of Nevada requested the Board's assistance and advice in connection with improving certain bad sanitary conditions by the pollution of a ditch. The engineer visited Nevada and made a report, a copy of which was sent to the health officer, and he was advised that he had full authority to remedy the conditions complained of and should do so.

A petition was received from thirty-six property holders in the vicinity of Clay and Seventh streets, Chillicothe, protesting against the use of a storm water sewer in Clay Street for domestic sewage. The engineer visited Chillicothe and made a report, and the board of public service of Chillicothe was notified that the domestic sewer in Clay Street should either be disconnected from the storm sewer and extended to some proper sanitary sewer, or that a large flush tank should be installed and operated

at the head of the storm water sewer in Clay Street opposite the end of Maple Avenue, in order to keep this sewer from becoming a source of offensive odors.

As authorized by the Board, an assistant engineer, Mr. Paul Hansen of Washington, D. C., has been employed. He has visited the following places to inspect their water-works or sewage system: Arcanum, Byesville, Brookville, Cambridge, Covington, Greenville, Leetonia, Newark, West Manchester, West Milton and Westerville.

On December 14th, at the suggestion of the board of health of Columbus, a meeting was held in the office of the State Board of Health for the purpose of devising ways and means of urging the next Legislature to authorize a sewage disposal plant for the Girls' Industrial Home, thus preventing the pollution of the public water supply of the city of Columbus. There were present at this meeting the mayor of Columbus, the members of the house from Franklin and Delaware counties, members of the Columbus board of trade and of various civic organizations and public institutions.

Respectfully submitted,

C. O. PROBST,  
*Secretary.*



## MARCH MEETING.

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A special meeting of the State Board of Health was held at the office of the Secretary on the evening of March 6th, 1906.

All members were present except Dr. Palmer, who was out of the state.

Mr. R. F. Proctor, representing the firm of Williams, Proctor and Potts, consulting engineers for Ravenna, was present and presented plans for a system of sewers and sewage purification for that village.

The matter was referred to executive session.

The President stated that the object of the meeting was to make provision for an investigation and report of all water and sewage purification plants in the state, in accordance with a recent act of legislature requiring such investigations to be made and making an appropriation of \$15,000 to pay the expense thereof.

The Secretary presented an outline of a plan for carrying on the investigation, advising that a competent man be secured to have charge of the field work for the sewage purification plants, and that another man be selected for similar work in connection with the water purification plants. He stated that these men should be capable of making both chemical and bacteriological examinations in the field, but that a number of such examinations would probably have to be made in the central laboratory, and that it would therefore be necessary to appoint a laboratory assistant in addition to the two extra engineers.

Dr. Miller moved, and it was voted, to approve the outline plan presented by the Secretary subject to such modifications as might be found necessary in carrying on the work.

Some discussion was held as to the relative positions of the two engineers and laboratory man to be engaged for the special work.

On motion of Dr. Warner, it was voted that the Secretary as executive officer, should have charge of the work, under the direction of the Board; that the engineers engaged in the work should be responsible to Mr. Pratt as chief engineer, and that Mr. Horton should direct and be responsible for all examinations made in the laboratory.

On motion of Dr. Miller, it was voted to appoint a committee of three, to consist of the President, Dr. Stanton and the Secretary, with authority to engage and fix the salaries of the engineers and others necessary to carry out the proposed investigation.

The Board then went into executive session.

It was moved by Dr. Crossland and seconded by Mr. Hartzell to

approve the plans for sewerage and sewage disposal for the village of Ravenna, as shown by the drawings submitted by Williams, Proctor and Potts, consulting engineers, on March 2, 1906, and also to approve the construction, for present installation, of three of the five sedimentation tanks, and four of the five sand filters, provided:

1st. That the operation of the plant be subject at all times, to the approval of the State Board of Health;

2nd. That the sand filtration beds be increased in an amount satisfactory to the State Board of Health whenever in the opinion of said Board the yield of sewage from Ravenna warrants such an increase; and,

3rd. That the sewage purification works be built before any of the proposed sewers are placed in use.

Those voting in the affirmative were Messers. Stanton, Chapman, Warner, Miller, Crossland and Hartzell.

In the negative, none.

There being no further business, the Board adjourned with the informal agreement that the next meeting would be held in Canton on the third Wednesday in April.

Attest.

C. O. PROBST,  
*Secretary.*

## APRIL MEETING.

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A regular meeting of the State Board of Health was held at the Hollenden Hotel, Cleveland, April 18, 1906, at 8 P. M.

All members were present.

The minutes of the January meeting, and of the special March meeting, were read and approved.

A delegation from Cuyahoga Falls, consisting of Dr. Searles, Mr. Grant and Mr. Peebles, appeared before the Board in regard to the modification of plans for a sewer system proposed for that village.

On motion of Dr. Stanton, the matter was referred to the chief engineer for investigation and early report.

The Secretary presented his quarterly report which, on motion of Dr. Warner, was accepted and ordered filed.

The President, as chairman of the committee appointed to select employes for the special investigation of water and sewage purification plants made a report.

The Secretary presented a report by the engineer upon a proposed water supply for the village of Leesburg, to be derived from wells located upon the so-called Mikoff lot, in the southeasterly portion of the corporation and adjacent to the Baltimore and Ohio Railroad.

It was moved by Mr. Hartzell and seconded by Dr. Palmer to approve this proposed supply provided that no source of pollution, which in the opinion of the State Board of Health would affect the public water supply, be allowed within 500 feet of any of the proposed wells.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller, Hartzell and Crossland.

In the negative, none.

The Secretary presented letters protesting against the appointment of J. R. Johnson as health officer for the village of Matamoras, to serve in lieu of a board of health.

The matter was referred to the Secretary for further investigation.

The Secretary presented a copy of the new law relative to conferences of the State and local boards of health, suggesting that some provision be made for such meetings.

On motion of Dr. Stanton, this matter was placed in the hands of the President and Secretary.

The examination of school children's eyes after the plan of Dr. Allport of Chicago, was brought up by the Secretary, and the advis-

ability of issuing a circular letter to the superintendents of public schools, showing the method of such examination and recommending that provision be made therefor, was discussed.

On motion of Dr. Warner it was voted to issue such a circular letter to the superintendents of schools, and methods for the examination were referred to a committee consisting of the Secretary and Dr. Warner.

Mr. E. J. Pinney of Collinwood, and other representatives of property holders along the lake front east of Cleveland, appeared before the Board and stated that they had great fear that the proposed intercepting sewer for the city of Cleveland, when completed and in use, would badly pollute the water along the lake front to the detriment of the health and comfort of many people. They requested that some investigation be made.

A somewhat lengthy discussion was entered into and the action of the State Board of Health in approving sewerage plans for Cleveland was explained by Mr. Hartzell. There was some difference of opinion as to just what the plans provide for.

On motion of Dr. Warner, it was voted that the chair appoint a committee to investigate the sewerage problem of Cleveland to determine, if possible, what relief could be given, if such relief were found to be necessary, and instructing the Secretary to report to the petitioners just what action had been taken by the State Board of Health up to the present time in reference to the sewerage of Cleveland.

The President appointed Mr. Hartzell, Chairman, Dr. Miller, Dr. Stanton, with the President and Secretary ex-officio members.

The Secretary presented a letter from Mr. Clarence Turner of Columbus, asking the Board to examine samples of milk purified by a patent process which had been introduced into a plant in Columbus, in which he is interested.

On motion of Dr. Stanton, the Secretary was instructed to inform Mr. Turner that this was not an examination that could be made by the State Board of Health.

The Secretary presented rules and regulations adopted by the health officer of Clarksburg.

It was moved by Dr. Crossland and seconded by Dr. Warner, to approve these rules.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Crossland, Miller and Hartzell.

In the negative, Dr. Palmer.

Matters previously acted upon by mail were taken up for confirmation as follows:

On motion of Dr. Warner and seconded by Dr. Palmer, it was voted to confirm the Board's action approving a sewer proposed for the Marietta Country Club, to discharge into the Muskingum River at a point about four miles above the city of Marietta, as described in the

application made to the Board by Mr. Edward B. Follett, secretary of the club, on January 27, 1906, provided the outlet of this sewer be so constructed that the sewage will not create objectionable conditions by flowing over the bank before it reaches the stream.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

On motion of Dr. Stanton and seconded by Dr. Palmer it was voted to confirm the Board's action disapproving of the construction of either a combined or storm water sewer in North 7th Street, Zanesville, until such time as a new suitable public water supply has been provided.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

On motion of Dr. Palmer and seconded by Mr. Hartzell it was voted to confirm the Board's action approving a proposed sewer for the North-westerly or Third Ward District of Warren, to discharge into the Mahoning River between Mason and West Prospect streets, upon the condition that this sewer be connected with an intercepting sewer for the entire city as soon as such sewer is built.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The Secretary was instructed to notify the authorities that when proposed additional sewerage for Warren was approved by the Board in 1895, a condition was imposed whereby the city was to install means for purifying the sewage of the entire city within two years from the date of approval; that it is the intention of this Board to make, as soon as dry weather conditions prevail, a thorough examination into the discharge of sewage at Warren, and that the results of this examination may show such objectionable conditions that the Board will find it necessary to require purification works for the city to be built at once.

Those voting in the affirmative were Messrs. Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, Dr. Stanton.

It was moved by Mr. Hartzell and seconded by Dr. Palmer to confirm the Board's action approving a new sewer in the southwestern portion of Cambridge for the discharge of domestic sewage into Wills Creek at a point near the present sewer outlet from the north side of the city provided:

1st. That the proposed sewer be constructed at such elevation that the sewage can be easily passed through purification works before discharging into the stream when it becomes necessary to construct such works; and,

2nd. That sewage purification works, satisfactory to the State



Board of Health, be constructed whenever in the opinion of said Board such works become necessary.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

On motion of Dr. Stanton and seconded by Dr. Warner it was voted to confirm the Board's action approving the sewers recently constructed in McGill, Sixth and Third streets, respectively, Lowellville, provided that the village council pass an ordinance forbidding the use of these sewers for household wastes, and that the sewer in Third Street be continued to a point below the dam near that street and there discharged.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

On motion of Dr. Palmer and seconded by Dr. Warner it was voted to confirm the Board's action disapproving of the spring, known as the Mackey Spring, as a source of additional water supply for Steubenville for the reason that the yield of the spring is so small in proportion to the entire water consumption that its use would not warrant introducing a possible source of future contamination of the public water supply; although the water of this spring at present would not be dangerous to health if the spring was properly protected.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Warner and seconded by Dr. Stanton to confirm the Board's action approving the plan to obtain a ground water supply for Canal Fulton from wells in an area immediately below the present water storage reservoir of Canal Fulton, provided:

1st. That the water from said wells, after thorough pumping, proves satisfactory to the Board; and,

2nd. That the water company purchase or obtain sole control of sufficient land surrounding these wells so that no source of pollution which, in the opinion of the State Board of Health, might affect the quality of the water be allowed within 200 feet of any well.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Warner and seconded by Dr. Stanton, to disapprove of an auxiliary supply for Canal Fulton, introduced without the approval of the State Board of Health, obtained from a farm well, unless the privy vault located within 40 feet of said well be removed at once to a point at least 100 feet from the well and on land sloping

away from it, and further that no other sewage or domestic wastes be deposited within 100 feet of this well.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The Secretary was instructed to notify the authorities that an investigation would be made in the future and if it should be found that the water from this well is still in danger of contamination, further changes will be required, or the use of the well will be permanently disapproved.

It was moved by Dr. Warner and seconded by Dr. Palmer to confirm the Board's action temporarily approving a proposed sewer for the Stirling Boiler Works at Barberton, as shown on plans submitted by the superintendent of the company, Mr. L. L. Summers, January 13, 1906, provided that the company agree to purify the future sewage in a manner satisfactory to the State Board of Health whenever sewage disposal works for the village are installed, or to connect with such disposal works.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Palmer and seconded by Mr. Hartzell to confirm the Board's action approving the system of sewage disposal adopted by The Interstate Engineering Company at Bedford, which provides for the discharge of sewage into Tinker's Creek at a point near the easterly village corporation line, provided:

1st. That the outlet consist of iron pipe which will discharge the sewage below the surface of the creek at all times; and,

2nd. That sewage purification works be installed whenever this is deemed necessary by the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Stanton and seconded by Mr. Hartzell to confirm the Board's action approving plans for a general system of domestic and storm sewers and sewage disposal for Norwalk, as shown on drawings submitted by E. G. Bradbury, consulting engineer, March 30th, 1906, provided:

1st. That the sewage disposal plant be constructed before any of the proposed sewers are placed in use;

2nd. That the sewage disposal plant be enlarged, in a manner satisfactory to the State Board of Health, if, after the plant has been in operation for a period of six months, the dry weather flow of sewage entering the new sewers is found to exceed 1,000,000 gallons per day;

3rd. That the sewage from that portion of Norwalk which, by reason of its low elevation, cannot be drained into the proposed system



of sewers, be treated at auxiliary disposal works of a design satisfactory to the State Board of Health, or be pumped to the proposed main disposal works whenever purification of the sewage from such district is deemed necessary by said Board;

4th. That the adjustment of the storm water overflows be subject at all times to the approval of the State Board of Health; and,

5th. That the automatic controlling devices for the contact beds be approved by the State Board of Health before being installed.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Stanton and seconded by Mr. Hartzell to confirm the Board's action approving proposed storm sewers for District No. 1 of Barberton, with an outlet into Wolf Creek in the northwesterly part of the village; it being understood that these sewers are to be used for storm water purposes only.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Warner and seconded by Dr. Palmer to confirm the Board's action disapproving the leasing of the Woodfield water-works storage dam to a fishing club.

Those voting in the affirmative were Messrs. Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, Dr. Stanton.

On motion of Dr. Warner, seconded by Mr. Hartzell, it was voted to confirm the Board's actions approving health officers appointed to serve in lieu of a board of health:

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The Secretary reported that in February the village clerk of Clarks-ville sent in a certificate of the appointment of Mr. Perry Wilson as health officer, to serve in lieu of a board of health. Later the former health officer, Ezekial Cast, wrote in that he had not resigned as health officer and that he was, in accordance with Section 223 of the Municipal Code, entitled to hold office until the first Monday in January, 1907. The matter was referred to the Attorney General, who held that a health officer could not be removed without cause before the expiration of his term. Mr. Cast was therefore notified that he would be considered health officer of the village until the expiration of his term, the second Monday in January, 1907, and the approval of Mr. Perry Wilson was rescinded.

It was moved by Dr. Crossland and seconded by Dr. Palmer to confirm the Board's actions approving rules and regulations adopted

by health officers, serving in lieu of a board of health, for the following places:

Lockbourne, Rock Creek, Salineville, Newton, Osgood, and Canal Winchester.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The Secretary reported that a recent examination of the water supply of Barberton had shown that there were several ways in which the public supply might be contaminated, and the board of trustees of public affairs was notified that the following changes should be made:

1st. Tightly close all manholes over the water-works, and also cover the sand catcher and the pump well, so that there will be no surface or other contamination at these points.

2nd. Replace the present vitrified conduit with an iron pipe with leaded joints, in order to prevent any possible entrance of creek water into the public supply.

3rd. All water used for cooling purposes in the pumping station should be wasted and not returned to the public supply.

4th. The emergency intake, at the plant of the American Sewer Pipe Company, should be locked and the key kept in the possession of the village health officer, so that polluted canal water can be turned into the public supply only in case of an extraordinary fire, with his knowledge; and if this should ever be done the health officer should immediately give public notice of the fact.

There being no further business the Board adjourned to meet in Canton on June 19th, 1906.

Attest:

C. O. PROBST,  
*Secretary.*

## QUARTERLY REPORT OF THE SECRETARY.

APRIL MEETING. 1906.

*Mr. President and Members of the Ohio State Board of Health.*

GENTLEMEN:—Your Secretary begs leave to offer the following report:

Since the last regular meeting of the Board, January 17, 1906, there have been 117 cases of smallpox reported. Seventy-nine of these cases were in Cincinnati and five in Dayton. The Dayton cases, and also one case in Sidney, Hamilton and Higginsport, respectively, were traceable to Cincinnati. April 7th a case of smallpox was reported in Cleveland, the first case to occur in that city for two years.

No investigations were made by medical inspectors on account of this disease.

February 1st, Dr. Platter visited Spring Valley, Greene County, on account of an outbreak of scarlet fever. He confirmed the diagnosis and advised the local authorities in regard to quarantine, disinfection, etc.

April 6th Mr. Hartzell visited Perry Township, Stark County, to investigate a nuisance complained of. A copy of his report was furnished to the complainant and to the local health authorities.

It came to the attention of the Board that there were some 52 cases of typhoid fever in Zanesville. The engineer made an investigation and a copy of his report was sent to the board of public service and the health authorities, and they were urged to use their power to bring about the installation of a pure water supply at once.

March 29th the bacteriologist investigated an outbreak of typhoid fever at Chardon.

The chief engineer visited Fostoria, where he talked to the council on the subject of filtration. The board of public service decided to build filtration works at once, in accordance with plans approved by the State Board of Health.

The chief engineer also visited Cincinnati, Pittsburg, the Montgomery County Infirmary, and the Epileptic Hospital at Gallipolis in regard to sewage disposal; Scio, Cambridge and Circleville in regard to sewerage; Steubenville, Middleport and Pomeroy in regard to water, and Marion and Toledo to inspect their sewage purification plants.

The chief engineer with the special assistant engineer visited the following places in connection with the special investigation of water and sewage purification plants in the state:

Alliance, Canton, Cleveland, Collinwood, Dayton, East Cleveland, Lakewood, Lancaster, Marion and Toledo. The special assistant engineer, in connection with the same investigation, also visited Fostoria, Kenton, Sandusky, Oberlin, North Amherst, Gallipolis and Westerville.

The assistant engineer visited Ashtabula to investigate an outbreak of typhoid fever, and Cleveland and Erie, Pa., in connection with the same; Akron, Arcanum, Canal Fulton, Crooksville, Granville, Johnstown, Iron-ton, Mantua and Warren in regard to water supplies; and Crooksville, Newark and Lowellville in regard to sewerage, Westerville and Bedford in regard to sewage disposal.

The assistant engineer also visited Collinwood to examine three sites proposed for a school house, upon request of a member of council. A report was made and furnished to the authorities.

The investigation of the water supply of Akron showed that the water of Summit Lake, the present supply, was being contaminated by the sewage from the Wellman-Seaver-Morgan Company's factory. The board of public service of Akron was notified that it should take immediate steps to cut off this pollution. The water company was also advised that the entrance into the present pump well of water from an old driven well might be causing contamination of the public supply and on account of the thickly populated district in which this well is located it should be disconnected from the pump well as soon as possible.

The investigation of the water supply of Greenville showed a safe water and, except for some iron and hardness, a satisfactory supply for domestic and municipal use. As the emergency intake had not been used for a long time the superintendent of the water-works was notified that whenever it is used more or less polluted water will be introduced into the system, and that the people should at such times be warned to boil the water.

The investigation showed the water supply of Westerville to be safe organically and unobjectionable except for hardness and iron. The board of trustees of public affairs was notified that this objection could be at least partially removed by providing increased storage, aeration, or other treatment.

The investigation of the water supply of Brookville showed a very satisfactory supply as regards organic characteristics, but considerable temporary hardness and more or less iron.

It appeared, from the investigation of the water supply of Arcanum, that the water-works had been built practically in accordance with the plans approved by the Board, but the board of trustees of public affairs was notified.

1st. That all private wells in the village which were liable to pollution should be condemned and not used for any purpose;

2d. That the privies at the tobacco warehouses, located near the

wells, should be made water tight and the village health officer should see that they are properly cleaned whenever necessary; and,

3d. That the use of a standpipe, so constructed that the water will be thoroughly aerated before entering it, will tend to reduce the objectionable amount of iron now in the water.

Complaint was made that the sewage of Greenville was polluting the well of the Winters Dairy Company. The assistant engineer made an investigation of the conditions complained of, collected samples of water for examination and submitted a report which showed that the well was apparently receiving no influence from the sewage, or any other dangerous source of pollution, and the company was so notified.

The city engineer of Newark asked the Board's advice concerning the imperfect construction of a 24-inch sewer in Oakwood Avenue. One of the assistant engineers visited Newark and found that the sewer discharged into an outlet built some twenty-five years ago and that it would therefore not come under the class of sewers which must be approved by the State Board of Health. The city engineer was advised that by careful work the sewer joints could be made practically water tight so that the sewer would be a source of less danger to private wells than are existing privies, located in immediate proximity to such wells, and it was recommended that this be done.

The advice of the Board was asked in regard to permitting a number of persons living in the easterly part of Circleville to connect, for domestic purposes, with a large storm water sewer located in Pickaway Street, which discharges into Hargus Creek. The chief engineer visited Circleville and made an informal report advising against the use of this sewer for such purpose.

It was learned that Ironton was proposing to obtain a water supply from shallow wells driven in the gravel bed of the Ohio River, to be located either at the Ice Creek site, so called, or at the White Oak Creek site. One of the engineers made an investigation and reported that either site was favorable so far as freedom from contamination from local sources was concerned, but that although a similar arrangement at Gallipolis is said to have been successful, infiltration wells and similar schemes have been unsuccessful at some places along the Ohio River, notably at Mingo, Ohio, and with the information at hand the Board would not be in a position to approve outright the proposed scheme. They were advised, however, that if they wished to go ahead and sink wells, we would make a thorough investigation as to the quality of the water and purification effected after thorough pumping, and if the water proved of good quality the Board would act upon the matter.

The authorities of Crooksville asked the Board's advice in regard to proposed water supply and sewerage for that village. One of the assistant engineers visited Crooksville and made a report, though no definite plans had been made. They were advised that if they wished to install a well



water supply test wells should be put down in a suitable location, and if after thorough pumping analysis showed the water to be of good quality, the matter would be acted upon by the Board.

The engineer's report indicated that it would not be safe for them to discharge unpurified sewage into Jonathan's Creek on account of the proximity of Roseville. It was suggested, informally, that they might easily make coarse filters of available broken pottery ware, at comparatively small expense.

Matters previously acted upon by mail should now be taken up for confirmation.

Respectfully submitted,

C. O. PROBST,  
*Secretary.*

## JUNE MEETING.

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A regular meeting of the State Board of Health was held at the Hotel McKinley, Canton, Ohio, June 19th, 1906, at 8 P. M.

All members were present.

Mr. L. S. Cooley and Mr. Smith, members of the board of public service of Wooster, appeared before the Board urging approval of a new source of water supply for that city. It was brought out in the hearing that the location of the wells had been examined by the engineer of the State Board of Health, and samples of the water had been examined in the laboratory, and that the water was not considered of good quality nor the location of the wells a very favorable one.

The engineer and city solicitor of Chardon presented plans for a system of sewers, with provision for sewage purification, which they asked to have approved.

On motion of Dr. Miller, it was voted to have the engineer visit Chardon and report upon the proposed plans.

Mr. George P. Shute, representing E. G. Bradbury, of Columbus, consulting engineer, presented plans for a sewage disposal plant for the Massillon State Hospital. These were referred to executive session.

Mr. Shute also presented plans for a system of sewers, with sewage disposal, for the village of Medina.

On motion of Dr. Crossland, action upon these plans was deferred until after a report could be made by the engineer.

Mr. Fuller, member of the board of public service of the village of Perrysburg, addressed the Board on the subject of a further water supply for that village.

This matter was referred to executive session.

The minutes of the last meeting of the Board were read, and on motion of Dr. Warner, approved.

The Secretary presented his quarterly report.

On motion of Dr. Stanton, the report was received and ordered filed for publication.

The annual report of the Board, prepared by the Secretary, was presented. The Secretary called special attention to one of the recommendations in the annual report, urging Legislature to make provision for a county health officer.

On motion of Dr. Miller, the annual report was approved.

On motion of Dr. Stanton, the President and Secretary were appointed a committee to formulate a bill providing for county health officers, as recommended in the annual report.



On motion of Dr. Miller, the Secretary was authorized to make arrangements for the distribution of antitoxin, in the manner recommended in his quarterly report.

On motion of Dr. Miller, it was voted to appoint a committee to consider and report upon a plan for instruction and examination of health officers, as recommended in the quarterly report of the Secretary.

The President subsequently appointed Dr. Stanton and the Secretary members of this committee.

The Board then went into executive session.

The President announced that the election of officers was next in order.

Dr. Stanton nominated Mr. Hartzell as President, and moved that the rules be suspended and the Secretary be authorized to cast the vote of the Board for Mr. Hartzell as President.

The motion was carried, the Secretary announced that he had cast the ballot as directed and the President declared Mr. Hartzell elected as President for the ensuing year, to take his seat at the October meeting of the Board.

Dr. Miller nominated Dr. Palmer for Vice-President, and moved that the Secretary be authorized to cast the vote of the Board for Dr. Palmer.

The motion was carried. The Secretary announced that he had cast the ballot of the Board as directed, and the President declared Dr. Palmer elected Vice-President for the ensuing year.

It was moved by Dr. Crossland, and seconded by Mr. Hartzell, to approve the report and drawings describing the proposed sewage purification plant for the Massillon State Hospital, submitted by E. G. Bradbury, consulting engineer, June 5th, 1906, provided:

1st. That the plant be operated, at all times, in a manner satisfactory to the State Board of Health; and,

2d. That the capacity of the plant be increased, in a manner satisfactory to the State Board of Health, whenever this is deemed necessary by said Board.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Stanton and seconded by Dr. Miller, to approve the scheme proposed for obtaining a public water supply for the village of Perrysburg from the Maumee River provided that the water be used for no other purpose than fire protection, sprinkling and sewer flushing, and that no connection between the water mains into which this water supply is introduced be made with any building, private or public, until such time as the village of Perrysburg shall build a filtration plant to the satisfaction and approval of the State Board of Health and until said Board has consented to the introduction of this water for purposes other

than fire, sprinkling and flushing sewers; and provided further that plans, showing location of intake, etc., be filed with the Board without delay.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Dr. Stanton, to disapprove the proposed source of water supply for the city of Wooster, to be obtained from driven wells in the valley of Apple Creek near the Pennsylvania Railroad, in the southern part of the corporation.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

Dr. Chapman brought up the question of the Board's last action in regard to sewerage for Sub-district No. 1 of District No. 42 of the city of Toledo, and stated that there was some reason being urged why the condition of approval should be modified. He thought the matter might be further investigated.

On motion of Dr. Miller, it was voted to refer this matter to the President and chief engineer.

It was moved by Dr. Palmer and seconded by Dr. Stanton, to approve the plans submitted June 5th, 1906, by the city engineer of Chillicothe, Mr. H. M. Redd, for a storm water sewer to be built in Honey Creek provided this sewer is not used for domestic purposes.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The Secretary presented a report in regard to new water supply for the city of Portsmouth. He stated that before preparing definite plans for a water supply, the city desired to have a definite expression from the Board as to whether or not plans for a filtration plant located in the center of the city and drawing water through the present intake, would be approved by the Board.

It was shown that the present intake is subject to sewage pollution, a considerable part of the city being on the banks of the river above it.

On motion of Dr. Stanton, seconded by Dr. Miller, the Secretary was instructed to notify the authorities at Portsmouth that this proposition would not be approved by the Board.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller, and seconded by Mr. Hartzell, to approve the project for obtaining a public water supply for Wauseon from flowing wells to be located in Franklin Township, eleven miles north of the village, in accordance with plans drawn by Wm. G. Clark, consulting engineer of Toledo, provided detailed plans, showing definite location of the

wells and surroundings, method of making connection with wells and method of conveying water to consumers, be submitted to and receive the approval of the State Board of Health before the water-works are built; and to disapprove the plan for obtaining a water supply from Cook's Spring Branch and North Branch of Brushy Creek.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Palmer and seconded by Mr. Hartzell to approve the plans of the water filtration plant of Upper Sandusky, submitted by Mr. Samuel J. Black, superintendent of the water-works company July 30th, 1905, provided:

1st. That the operation and care of the plant be subject at all times to the approval of the State Board of Health and that any change in the method of operation or in the use of the coagulant be made when requested by said Board:

2nd. That the plant be enlarged in a manner satisfactory to the State Board of Health whenever in the opinion of said Board this is warranted by the water consumption of the city; and,

3rd. That the clear water reservoir be suitably covered and protected from all possible pollution.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

Actions previously taken by mail were then taken up for confirmation as follows:

It was moved by Dr. Stanton and seconded by Dr. Miller to confirm the Board's action approving the plans and specifications for the construction of a head house, chemical house, filter house, valve houses, wash water reservoir and other miscellaneous work in connection with the filtration plant for Cincinnati, as shown upon drawings submitted by G. H. Benzenberg, acting chief engineer of the board of trustees, "commissioners of water-works," provided that the conditions of approval, as set forth in the Board's letter of September 20, 1905, be still in force and be made a part of the approval of the plans now submitted; and also, that proper provision be made in the chemical house for substituting alum for lime and iron, in case this is found to be desirable later; and that the plans for controllers, lime mixing devices and any other apparatus which may in any way affect the operation of the plant be submitted to the Board for approval when decided upon.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Mr. Hartzell to confirm the Board's action approving the use of water from the circular

dug well, some 15 feet in diameter, and also from driven wells, some 80 feet deep, located in the southeasterly portion of Plymouth, on land owned by the village immediately north of the Northern Ohio Railroad and bordering the Huron River, provided:

1. That the sewer which now discharges at the top of the bank a few hundred feet northeast of the location be diverted and made to connect with the main sewer of the village;

2. That the drainage originating in the vicinity of the railroad water tank be conveyed through a properly constructed sewer and disposed of in connection with the remaining sewage of the village;

3. That no source of pollution which, in the opinion of the State Board of Health, would affect the quality of the water be permitted within 500 feet of any well used as a source of the public water supply; and;

4. That all direct connection with the creek, by means of which unpurified creek water can enter the distribution system, be cut off.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Palmer and seconded by Dr. Stanton to confirm the Board's action disapproving certain sewers in Plymouth, constructed without the approval of the State Board of Health, which were installed by the commissioners of Richland County, the trustees of New Haven Township, and the village of Plymouth, respectively, and which discharge as follows:

- (a) At a point in the southeasterly part of the village near the top of a bank bordering the water-works property;

- (b) Into Huron River 200 feet south of Main Street, or County Line Road; and,

- (c) Into the Huron River at a point a few hundred feet north of said County Line Road; and further give to the village six months time in which to construct an intercepting sewer to convey all domestic sewage to a point below the village and there purify it in a manner satisfactory to the State Board of Health; provided that in case of failure to carry out this provision within the specified time, all householders be compelled to discontinue the use of the present sewers.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Mr. Hartzell and seconded by Dr. Stanton to confirm the Board's action approving of a proposed outlet for a private sewer system for Covington, as shown on sketch submitted by J. L. Cramer, May 18, 1906, provided:

1. That definite plans and specifications be submitted later for approval by this Board and that these plans and specifications provide



that the outlet be located at such a point that the sewage for the entire village can, when necessary, be drained to it;

2. That this outlet be located at least 150 feet below the emergency intake of the village water-works;

3. That the main sewer be of such a grade that it can be easily continued to a proper site for a sewage purification works in the future; and,

4. That sewage purification works, of a design satisfactory to the State Board of Health, be installed and placed in operation whenever this is deemed necessary by said Board.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Dr. Palmer to confirm the Board's action disapproving the proposed amendment to the sewerage plans for Cuyahoga Falls, as approved in August 1903, to wit: An amendment calling for the discharge of sewage through five different outlets, two located at Portage Street, two at Broad Street, and one at a point some 600 feet below Broad Street; and, further to approve amended plans by which the sewage from that portion of the easterly side of the village which it is now desired to sewer may be conveyed through iron pipe across the bridge at Portage and at Broad streets and discharged through the proposed westerly or Front Street 18-inch interceptor into the Cuyahoga River at the location and in a manner already approved.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Palmer and seconded by Dr. Stanton to confirm the action of the Board approving a proposed sewer at New Bremen, to discharge into a ditch leading ultimately into the St. Marys River, as shown upon plans submitted April 21, 1906, by A. M. Steinebrey, village clerk, provided:

1. That a continuous stream of not less than 3,000,000 gallons of water per day be diverted from the Miami Canal (after making the necessary arrangements with the State Board of Public Works) and passed through the ditch, in order to dilute the sewage from the proposed sewer as well as from the present sewers;

2. That sewage purification works, satisfactory to the State Board of Health, be installed and operated when this method of disposal by dilution becomes, in the opinion of the Board, inadequate, and,

3. That all catch-basins connected with the present and proposed sewers be trapped and that these catch-basins, as well as the sewers themselves, be flushed at regular intervals in order to prevent the accumulation of foul deposits in the sewers.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Stanton and seconded by Mr. Hartzell to confirm the Board's action approving the plans of proposed sewers for Rockford, as shown upon drawings prepared by C. M. Smith, consulting engineer and submitted by F. W. Miller, village clerk, April 10, 1906, provided:

1. That the present drain which parallels the Cincinnati Northern Railroad be discontinued for use as a domestic sewer;

2. That the proposed sewers be built on the separate rather than the combined plan, and that all domestic sewage be collected through the system of small pipes and discharged into the St. Marys River at the location proposed near the foot of Franklin Street; and,

3. That sewage purification works, of a design satisfactory to the State Board of Health, be installed and placed in operation whenever, after investigation, such works are deemed necessary by said Board.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The secretary was instructed to advise the authorities that when the question of sewage purification comes up, the separate system would be most economical and practical; and by reducing the size of the proposed sewer to 8-inch and 10-inch a large sum of money can be saved and this sum be put into storm water sewers of sufficient length, in connection with the paved gutters, to take care of all the storm water necessary.

It was moved by Mr. Hartzell and seconded by Dr. Stanton to confirm the Board's action approving of a proposed amendment to general plans for the sewerage system of Willoughby, which general plans were approved conditionally, on April 28, 1904, said amendment to consist in locating the main sewer outlet at a point at least 700 feet below the highway bridge at Lake Street or Mentor Road, so-called, instead of at the point shown on the plans previously approved, with the provision that the amended plans be subject to the same conditions of approval as were the former plans; i. e.:

1. That the outlet pipe be so located and constructed that no nuisance will be caused to those living nearest to it; and,

2. That purification works, satisfactory to the State Board of Health, be installed when deemed necessary by said Board. Detailed plans of the sewerage system to be submitted for approval when made.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Stanton and seconded by Mr. Hartzell to con-

firm the actions of the Board approving health officers, appointed by the council of their respective villages.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Dr. Stanton to confirm the Board's action approving the appointment of J. R. Johnson as health officer of New Matamoras, upon the recommendation of Dr. Heinlein, one of the medical inspectors, after a personal visit to the village.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Palmer and seconded by Mr. Hartzell to confirm the Board's action appointing Z. T. Hebble as health officer of Fairfield, to serve in lieu of a board of health, for a term of two years and at a salary of \$50 per year.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Dr. Palmer, to confirm the actions of the Board approving the rules and regulations adopted by the health officers of Larue, Macksburg, Pickerington, and New Matamoras.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

There being no further business the Board adjourned to meet in August in Cleveland, at the call of the President, should he deem it necessary to call a meeting at that time.

Attest:

C. O. PROBST,  
*Secretary.*



## QUARTERLY REPORT OF THE SECRETARY.

## JUNE MEETING, 1906.

*Mr. President and Members of the Ohio State Board of Health.*

GENTLEMEN:—Your Secretary begs leave to present the following report:

Since the last meeting of the Board, April 18, there have been reported 146 cases and 1 death from smallpox. The greatest number, 67, being in Cincinnati. Since January 1st, 263 cases have been reported; 124 in Cincinnati and 50 in Belmont, Jefferson and Harrison counties.

The disease is most prevalent in Bridgeport, St. Clairsville, and Martins Ferry, Belmont County; New Athens, Harrison County, and Warren Township, Jefferson County. The spread of the disease has been due to the failure to recognize the first cases, which were diagnosed chicken-pox and Cuban itch.

Smallpox is now present in the following counties: Belmont, Butler, Clermont, Erie, Hamilton, Harrison, Jefferson, Licking, Logan, Mahoning, Marion, Montgomery, Seneca and Wood.

Dr. Stanton investigated smallpox at Milford, Clermont County, traceable to Cincinnati.

Dr. George Chapman visited Glandorf, Putnam County, on account of smallpox; and Freedom and Montgomery townships, Wood County, the disease in the latter case being traceable to Toledo.

Dr. Heinlein visited Tiltonsville, and Warren Township, Jefferson County; and Dr. Moninger visited Newark, on account of the disease.

At the request and expense of the local authorities, Dr. Heinlein also visited St. Clairsville and New Athens on account of smallpox.

Dr. Palmer visited Dorset Township, Ashtabula County, to investigate a cheese factory.

Dr. Crossland investigated an outbreak of scarlet fever at Quaker City.

Dr. Stanton visited Oxford in regard to a nuisance and made a report, which was furnished the local authorities.

Dr. Platter investigated an outbreak of scarlet fever at Cuyahoga Falls; and diphtheria at Minerva.

In the regular work of the Board, the chief engineer, or his assistant, has made an inspection in the following places:

In regard to water supply: Batavia, Barnesville, Bellaire, Cridersville, Delta, Freeport, London, Mt. Gilead, Perrysburg, Piqua, Portsmouth, Warren, Wauseon, West Milton and Wooster.

In regard to sewerage: Chaseland, a suburb of Columbus; Cuyahoga Falls, Covington, Marion, Medina, Napoleon, New Bremen, Rising Sun, Rockford, Salem, St. Marys, Urbana, Wilmington and Willoughby.

Barberton, Milan and Wapakoneta were visited in regard to nuisances.

The special investigation, authorized by legislature, of all water and sewage purification plants in the state, is well under way. Two assistant engineers, with a helper and a stenographer have been engaged for the work. The communities or institutions having either a water purification plant or sewage disposal works, have been visited by the chief engineer and one or the other of the assistants. A letter, in advance of their visit, was sent, in case of municipalities, to the board of health, health officer, mayor and council, board of public service and board of public affairs, explaining the objects of the investigation. It is encouraging to report that in all cases the representatives of the Board met with a warm reception and a great interest is shown in this investigation. In a good many of the places having sewage disposal works changes that would seem to be beneficial as regards efficiency have been recommended to the local authorities.

The trustees of Union Township, Union County, petitioned the Board to make an examination of a certain portion of the territory in that township bordering on Treacles Creek bottom and to recommend some way of improving the unhealthy conditions which existed. The assistant engineer visited the territory in question May 12, and made a report which seemed to establish the fact that the flooding of lands by the creek, at times, produced a condition that must be prejudicial to public health; and recommended that the most feasible and efficient method of improving the sanitary conditions of the neighborhood would be to place a dam across the mouth of the creek and drain the territory in question through a large ditch extending about two and one-half miles to Big Darby Creek. A copy of this report was sent to the trustees.

The health officer of Greenville asked the Board to make an examination previous to the construction of a slaughter house with a drain into Greenville Creek; it being feared that on account of prevailing west winds disagreeable odors would be carried to the city and cause a nuisance. Also the possibility of pollution of the water about the emergency intake was feared.

The assistant engineer visited Greenville May 15, and made an investigation. From his report it appeared that the project of discharging more filth into the small creek at Greenville was undesirable, especially when considered in connection with the fact that the main sewer outlet of the city was approved in 1900 only upon condition that the sewage be purified within five years; and from available information it seemed that purification of the entire sewage of the city would be necessary in the near future. On this account any additional pollution of the creek,

as proposed from the slaughter house drain, should not be permitted. A copy of this report was furnished the health officer.

Complaint was made to the Board of the method of disposing of wastes from certain houses in Chaseland, a suburb of Columbus. The chief engineer made an investigation and found that the National Land Company had constructed a sewer which discharges through a culvert into a small water course, and that the outlet had not been submitted to the State Board of Health for approval. A letter was addressed to this company, calling attention to Section 409-25 R. S., and stating that they should see that all connections through which domestic wastes of any kind could be discharged into this sewer are cut off; or otherwise it would be necessary to continue this sewer to a proper site for purification works and there purify the sewage.

The health officer of Milan asked the Board to send a representative there to investigate a nuisance caused by the discharge of wastes from a brewery into a small creek in the southeastern part of the village.

The assistant engineer visited Milan on May 29, and made an investigation. From his report it appeared that the most reasonable way to abate the nuisance would be to extend the drain from the brewery for a distance of about 1,000 feet and allow it to discharge into a ditch at a point well removed from any habitation. A copy of the report was furnished the health officer.

The co-operative work with the Division of Hydro-Economics of the United States Geological Survey will terminate June 30th. During the past two months experiments have been made in the purification of waste liquids from creameries. A small experimental plant has been in daily operation on the top of the State House building. A larger experimental plant has been operated at the creamery of French Brothers at Blanchester. Some progress has been made but no definite results can be reported at this time.

The experimental plant at the state house will be operated after the termination of our contract with the United States Government, with the hope that results which may be of some value to creamery operators may be obtained.

In connection with this co-operative work reference should be made to a petition which was sent to the Governor by residents in the vicinity of Lynchburg, making complaint of the pollution of a stream at that place by refuse from a distillery. An investigation of the complaint was made by the chief engineer and a copy of his report with the following letter was sent to the Governor:

COLUMBUS, OHIO, June 6th, 1906.

HON. JOHN M. PATTISON,  
*Governor of Ohio.*

DEAR SIR:—The complaint you referred to me from petitioners in Highland County in regard to the pollution of the East Fork of the Little Miami River by

wastes from the distillery of Freiberg and Workum, has been received and investigated.

The facts in the case are fully set forth in the report of our chief engineer a copy of which is enclosed herewith. In brief they are these:

The stream in question has been for years past badly polluted, at times, by wastes from the distillery. It is so polluted at the present time, and is a just cause for complaint.

The source of the pollution has now been largely removed, and will be entirely stopped after July 1st, when the distillery will be closed for the summer.

When the attention of the State Board of Health was called to this matter in the fall of 1904, an investigation showed that the distillery had been closed for some months, and that no polluting material was going into the stream.

The proper solution of the question appeared to be to devise some suitable plan for satisfactorily disposing of the distillery wastes, and the owners, after a conference, expressed a willingness to heartily co-operate to that end.

After some experimentation what seemed to be a feasible plan for recovering the wastes, which were shown to have considerable food value, was found and recommended.

Apparatus for this work was introduced last year at a cost of about \$30,000. This, on the whole, has been quite satisfactory, and, with some changes that are to be made, and from the experience gained in methods of operation, it is believed that in the future all waste substances from the distillery can be properly cared for at a profit, and the nuisance entirely abated.

The present trouble seems to be almost wholly due to running comparatively pure water into an old reservoir containing putrescible matter turned into it before the disposal apparatus was introduced, and permitting the overflow from this reservoir to be periodically discharged into the stream. This, we are assured, will be no longer permitted.

Further investigation of this stream will be made after the distillery resumes operations next fall.

Very respectfully,

(Signed) C. O. PROBST,

Secretary."

Enclosure.

#### THE FREE DISTRIBUTION OF ANTITOXIN BY LOCAL BOARDS OF HEALTH.

Some weeks ago an agent of the Lederle Antitoxin Laboratories of New York City called upon me in regard to supplying the State Board of Health with antitoxin to be furnished to local boards of health gratuitously for use in indigent persons suffering with diphtheria. Dr. Lederle, you will recall, was formerly at the head of the health department of New York City. He is furnishing antitoxin to the state boards of health of Pennsylvania, Indiana, and I believe some other states. I informed him that this Board had no fund for purchasing antitoxin, but that it might be possible, if agreeable to the manufacturer, that some arrangement could be made whereby we would keep antitoxin on hand to be furnished local boards of health upon request and to be paid for by the local authorities. Dr. Lederle, has agreed to make such arrangements for the distribution of antitoxin as the Board may desire.

To ascertain whether local boards of health have authority to purchase antitoxin for use in the cure and prevention of diphtheria in



indigent persons the following communication was sent to the Attorney General:

"COLUMBUS, OHIO, June 14, 1906.

HON. WADE H. ELLIS,

*Attorney General, Columbus, O.*

DEAR SIR:—House Bill No. 378 by Mr. Tinker, to provide for furnishing diphtheria antitoxin to persons in indigent circumstances, was passed by both houses of the last Legislature, but inadvertently was not messaged for signature and therefore failed to become a law.

I wish you would please inform me whether local boards of health do not already have authority to furnish antitoxin gratuitously to indigent persons, for the treatment of those afflicted with diphtheria as well as for the prevention of the disease in persons necessarily exposed thereto? In deciding this question I beg you to take into consideration the following:

A recent review of diphtheria statistics by Biggs and Guerard, in which the experience in hospitals not only in this country but in all the cities of Germany and France of over 20,000 inhabitants was taken, shows that there has been an average reduction of mortality for the use of antitoxin in the treatment of diphtheria of not less than 50 per cent.

As the public is more or less exposed in the burial of every dead body that has died of diphtheria, this saving of 50 per cent. of the cases treated should lessen the danger from such exposure one-half.

It is further shown that in the treatment of diphtheria by antitoxin the duration of the disease in those who recover is lessened nearly one-half. The danger to the public from exposure is thus greatly reduced by diminishing the period during which the disease may be communicated.

Another use to which antitoxin may be put is to prevent the disease in persons who are necessarily exposed to it. Park of New York, for instance, has recently reported upon 1,043 cases exposed to diphtheria in their tenement district who were given immunizing doses of antitoxin with the result that all but three of the number were completely protected from the disease. The commission of health of Chicago says that out of 7,051 exposed persons who received such an immunizing dose only 46 subsequently developed diphtheria, and all of these recovered. Recently, in our own state, diphtheria made its appearance at the Girls' Industrial Home at Delaware. All of the girls in one cottage where the disease appeared were given small doses of antitoxin with the result that they all escaped diphtheria.

Very respectfully,  
(Signed) C. O. PROBST,  
*Secretary."*

To this he replied in part as follows:

"I am of the opinion that the expense thereby created is included within the language of Section 2138 R. S., and that the following language, there employed, is not limited to periods of epidemics, viz:

'And when expenses are incurred by the board of health, under the provisions of this chapter, it shall be the duty of the council, upon application and certificate from the board of health, to pass the necessary appropriation ordinances to pay the expenses so incurred, etc.'

"I therefore conclude that, in the event of the prevalence of diphtheria, in a given community, if the local board of health duly adopt an order or regulation to furnish antitoxin for the treatment of indigent persons afflicted with such disease, or exposed thereto, the indebtedness thereby created would be a valid indebtedness of the municipality or the taxing district, in which the same was thus authorized."

I have prepared a rough draft of a letter which might be sent, if the Board approves of this plan, to all boards of health and health officers in the state. It might be advisable to send an explanatory letter to all the physicians in the state, although this would be attended with some expense. Possibly if the medical journals of the state were notified of what the Board is proposing to do in this matter, that would suffice. I would suggest that it would be of some value to furnish boards of health with a suitable blank to be filled in by physicians using antitoxin furnished in this manner, which would afford information of a statistical value. I believe the plan would be a good one, and wish to recommend that it be adopted in a general way, with such modifications as the Board may suggest.

#### EXAMINATION OF HEALTH OFFICERS.

My friend, Dr. J. N. Taylor of Crawfordsville, Indiana, for many years president of their state board of health, wrote me recently that he was going to propose to the Indiana board that they offer to examine physicians who had followed a certain course of reading in sanitation and health board work, and grant diploma of some sort to those who passed a successful examination. He asked me for suggestions as to the course of study that ought to be prescribed.

The idea struck me as a good one, and if the Legislature should make provision for county health officers, as recommended in our last annual report, a considerable number of men might be induced to take such examination. It might be arranged to hold the examination at the time of the conference of the State Board of Health with municipal health officers. This plan, or some modification of it, might be the means of securing a better class of health officers than we have at present, and also help to retain them in office.

I bring this forward now simply for discussion and possibly if the Board thinks it wise, for the appointment of a small committee to further consider the matter and report upon it at the next meeting.

Matters previously acted upon by mail should now be confirmed by a *visa voce vote*.

Respectfully submitted,

C. O. PROBST,  
*Secretary.*



## OCTOBER MEETING.

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A regular meeting of the State Board of Health was held at the Hotel Havlin, Cincinnati, at 8 P. M., October 17th, 1906.

All members were present.

The minutes of last meeting were read and, on motion of Dr. Stanton, approved.

Dr. Chapman in the chair then announced that the time had arrived when the president elected at the June meeting should take his seat, and Mr. Hartzell assumed the chair.

The city solicitor, city engineer, and two members of council of the city of Springfield appeared before the Board, requesting that certain modifications to plans for a sewerage system with disposal works for that city be allowed.

After a hearing they were asked to present their request in writing. The secretary read his quarterly report.

On motion of Dr. Miller the report was approved and filed for publication.

The secretary presented a letter from Judge J. B. Driggs of Bridgeport, Ohio, in regard to granting a small fishing club of Woodsfield the privilege of fishing in the reservoir which supplies that village with water; it being shown that proper care would be taken to prevent any pollution of the water.

On motion of Dr. Chapman, seconded by Dr. Miller, it was voted to grant this request.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The secretary presented plans of Messrs. Chapin and Knowles, consulting engineers, for a sewage disposal plant for the city of Salem, with a report by the chief engineer thereon.

On motion of Dr. Miller, seconded by Dr. Crossland, it was voted to approve said plans upon the following conditions:

1st. That the plant be enlarged, in a manner satisfactory to the State Board of Health, when deemed necessary by said Board;

2nd. That the dosing pond be reduced so that it will hold about 50,000 gallons;

3rd. That the automatic apparatus be replaced by a single siphon discharging by means of gates on to any filter desired;

4th. That the entire area of filters as shown on the plans be constructed as the first installation, and,

5th. That the method of operation of the plant be at all times satisfactory to the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The amendments to plans for a sewerage system for the city of Springfield were then taken up for consideration. These were to consist of:

I. That portion of the high level interceptor shown in red upon plan presented;

II. The outfall sewer with temporary outlet as shown in green on said plan;

III. The portion of the low level interceptor shown in blue on said plan; and,

IV. The Indian Run interceptor shown in green on said plan.

An outlet for the outfall sewer to be discharged into the Mad River at some point in the vicinity of the proposed location of the sewage disposal plant, as shown upon said plan.

The said sewers to be constructed in exact accordance with the plans heretofore approved by the State Board of Health.

It was moved by Dr. Chapman and seconded by Dr. Stanton to approve these plans as presented provided that sewage disposal works, satisfactory to the State Board of Health, be erected and operated whenever this shall be deemed necessary by said Board.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The secretary presented a communication from Mr. E. G. Bradbury, consulting engineer, requesting that the village of Cuyahoga Falls be permitted to construct a portion of the sanitary sewerage system designed by Messrs. Snow and Barbour and heretofore (1903) approved by the Board, to include the principal built up portion of the village and to discharge into the Cuyahoga River at a point near Prospect Street.

On motion of Dr. Crossland, seconded by Dr. Palmer, it was voted to approve this amendment to original plans for sewerage with the outlet located at any desirable point below the lowest dam in the village; and provided further that plans showing the exact location of the outlet sewer be filed with the Board.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The secretary presented a report of the work in the laboratory for the past quarter.

He also presented reports of the assistant engineer upon investigations made by him of an outbreak of typhoid fever at Youngstown; the

sewerage of Greenville, and the sewerage of Ada; and stated that the attention of the authorities at Lima had been called to the possible pollution of their water supply by the sewage of Ada.

A report was also presented by the secretary showing the favorable progress of the special investigation of the water and sewage purification plants in the state.

The question of arranging for the joint meeting of State and local boards of health was discussed and was referred back to the committee having this matter in charge without definite action.

Matters previously acted upon by mail were then taken up for confirmation as follows:

It was moved by Dr. Palmer and seconded by Dr. Miller to confirm the action approving plans for a proposed water supply for Garrettsville, to be derived from wells located at the confluence of two small valleys on the farm of Colton and Newcomb, said plans having been prepared by Mr. L. E. Chapin, consulting engineer, and presented to the Board July 9th, 1906, provided, for future protection of the wells against pollution, the village purchase or pass regulations controlling all the land surrounding the wells so that no sources of pollution can be located within 500 feet of any well.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The secretary was instructed to suggest the advisability of making some provision for the removal of the iron from the water, unless after prolonged pumping it should be found that the iron has been very much decreased.

It was moved by Dr. Stanton and seconded by Dr. Chapman to confirm the Board's action approving plans for a proposed new water supply for Medina, to be derived from the north branch of Rocky River at a point about three miles northeast of the center of the city, as shown upon drawings submitted by Mr. E. G. Bradbury, consulting engineer, July 31st, 1906, provided:

1st. That filters of a design satisfactory to the State Board of Health be installed whenever this is deemed necessary by said Board; and,

2nd. That the board of trustees of public affairs of Medina adopt and enforce a set of rules and regulations, for the protection of the watershed of the north branch of the Rocky River above the proposed water works; first submitting such rules and regulations to the State Board of Health and receiving its approval.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Dr. Stanton to confirm the Board's action sustaining its former action approving plans for sewer-

age for Sub-district No. 1, of the main Sewer District No. 42, of the city of Toledo, taken December 1st, 1905, namely, provided that the outfall sewer for this sub-district be extended down the Ottawa River to a point beyond land which is to be used for park purposes and that the dry weather flow, at least, be discharged into deep water through a submerged outlet; and provided also that whenever this outlet becomes a nuisance, in the opinion of the State Board of Health, provision shall immediately be made for disposing of the sewage being discharged thereat, in a manner satisfactory to the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The secretary was instructed to suggest that it would be possible, without a greatly increased total cost, to install an 8-inch or 10-inch main sewer, to be used for house drainage only, instead of the 30-inch sewer proposed, and to use the amount thus saved in constructing a small sewage disposal plant for this sub-district.

Also to suggest the possibility of extending the sewer in Central Avenue to include the sub-district in question.

It was moved by Dr. Warner and seconded by Dr. Chapman to confirm the Board's action approving plans for proposed sewerage and sewage purification for Medina, as shown upon drawings submitted to the Board by Mr. E. G. Bradbury, consulting engineer, June 19th, 1906, provided:

1st. That both the northerly and southerly plants be enlarged in a manner satisfactory to the State Board of Health whenever this is necessary in the opinion of said Board; and,

2nd. That the operation of the sewage disposal plants be at all times subject to the approval of the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Chapman and seconded by Dr. Miller to confirm the Board's action approving plans for sewerage and sewage disposal for Columbiana, as submitted by Mr. E. G. Bradbury, consulting engineer, on July 23rd, 1906, provided:

1st. That the operation and management of the sewage disposal plant be at all times satisfactory to the State Board of Health;

2nd. That any change in or enlargement of the plant be made when deemed necessary by the State Board of Health;

3rd. That samples of the filtering material be submitted to the Board for approval before it is placed in the filters; and,

4th. That the village purchase or obtain control of, as a site for sewage disposal works, an area of land of such size that the filters may be placed at least 300 feet from any of its boundaries.



Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Palmer and seconded by Dr. Stanton to confirm the Board's action approving plans for a proposed sewer in Adams Street, Sandusky, to discharge at the foot of Warren Street, as submitted by Mr. A. C. Schultz, city engineer, on June 12th, 1906.

Those voting in the affirmative were Messrs. Stanton, Chapman, Palmer, Crossland, Warner, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Chapman and seconded by Dr. Stanton to confirm the Board's action disapproving plans for a proposed sewer in High Street, Mineral City, as shown on sketch submitted by Mr. C. Edward Holden, mayor, July 9th, 1906, unless the sewage be purified in a manner satisfactory to the State Board of Health before it is discharged into the creek.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The secretary was instructed to notify the authorities that in case the village does not build the proposed sewer it is important that it adopt and enforce proper rules and regulations regarding the cleaning of vaults and cess-pools.

It was moved by Dr. Stanton and seconded by Dr. Palmer to confirm the Board's action disapproving plans for proposed sewers in Gorgas Street, Louisville, unless the sewage be purified in a manner satisfactory to the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The secretary was instructed to notify the authorities that it is very important that they have made, by a competent engineer, comprehensive plans of domestic sewerage, with a sewage disposal plant, for the village, and after having such plans prepared the sewers could be built as needed.

It was moved by Dr. Chapman and seconded by Dr. Miller to confirm the Board's action disapproving a proposed sewer outlet for the West Vernon Land Company, to discharge sewage into the Kokosing River as shown upon plans submitted by Mr. R. M. Douglass, civil engineer for the company, on July 30th, 1906, unless the sewage discharging through it be purified in a manner satisfactory to the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Dr. Warner to confirm the Board's action approving plans for a sewage disposal plant for the Mennonite Old People's Home, near Rittman, as shown upon drawings submitted by Mr. Philip Mackley, consulting engineer, on August 2nd, 1906, provided:

1st. That two filter beds not less than 25 feet square be built, instead of the one bed shown on the plans;

2nd. That the size of the septic tank proposed be reduced to a capacity of not over 300 gallons; and,

3rd. That samples of filtering material be submitted to the State Board of Health for approval before this material is placed in the filters.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Chapman and seconded by Dr. Stanton to confirm the Board's action approving plans for a sewage disposal plant for a portion of the village of Chardon about one-quarter of a mile southwest of the center of the village, as shown on plans submitted by Mr. E. S. F. Phelps, village engineer, July 27th, 1906, provided:

1st. That the construction of the septic or settling tanks be omitted;

2nd. That a dosing tank holding 1000 gallons be installed and provided with an automatic siphon of a design satisfactory to this Board;

3rd. That there be constructed four filter beds, each containing an area of not less than 500 square feet;

4th. That samples of filtering material be submitted to the State Board of Health for approval before placing any material in the filters; and,

5th. That any enlargements, changes in construction or in methods of operation be made when directed by the State Board of Health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Stanton and seconded by Dr. Chapman to confirm the Board's action disapproving of a proposed extension of the present sewer in West Jefferson, to discharge into a mill race leading to Little Darby Creek, unless all connections with the present sewer from overflows, cesspools and other domestic wastes be first cut off and the proposed sewer and all sewers connecting with it be used for storm water only.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

The secretary was instructed to advise the authorities of the import-



ance of their taking steps to provide a suitable sewerage system for domestic sewage.

It was moved by Dr. Chapman and seconded by Dr. Stanton to confirm the Board's action approving plans for a sewage purification plant for the suburban settlement of Woodcrest, near Youngstown, as shown on drawings submitted by Mr. Harry M. Reel, civil engineer of Youngstown, on August 14th, 1906, provided the plant be enlarged, if considered necessary by the State Board of Health, when the amount of sewage to be treated by it exceeds 7,500 gallons.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Dr. Chapman to confirm the Board's action approving the tract of land owned by the village of Oberlin, located along Plum Creek about three miles east of the village, as a site for sewage purification works; and to disapprove of the method proposed for operating the sewage purification works unless the sewage be further purified by filtration, in a manner satisfactory to the State Board of Health, and unless the purification plant be operated during the entire year.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Palmer and seconded by Dr. Miller to confirm the Board's action approving a sewer to be built on property owned by Mr. Henry B. Peters at Lancaster, to discharge into Baldwin Run, and to be used for the purpose of conducting the sewage from a number of houses to the run until such time as a proper system of sanitary sewers for the entire city of Lancaster shall be installed.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Dr. Warner to confirm the Board's action approving plans for a sewage disposal plant for Maplecliff, a portion of Lakewood, as shown upon drawings and described in a communication submitted by Mr. Charles W. Root, village engineer, on September 7th, 1906, provided:

1st. That the method of operation of the plant be at all times satisfactory to the State Board of Health; and,

2nd. That the plant be enlarged, in a manner satisfactory to the State Board of Health, when deemed necessary by said Board.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Chapman and seconded by Dr. Palmer to

confirm the Board's action approving a proposed sewer outlet for the portion of District No. 1, in the vicinity of Main Street, Conneaut, as shown upon plans submitted by Mr. H. G. Kingdon, city solicitor, on August 3rd, 1906, provided:

1st. That sewage purification works, of a design satisfactory to the State Board of Health, be constructed when deemed necessary by said Board for the purification of the sewage of the district now under consideration as well as that of districts where sewer outlets have previously been approved with similar conditions, and,

2nd. That the proposed outlet be continued by means of an iron pipe to a point below low water level in the river.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Warner and seconded by Dr. Stanton to confirm the Board's action approving a proposed sewer in Madison Avenue and Fourth Street, Steubenville, to discharge into the Ohio River through a submerged iron pipe terminating below low water level, as shown upon drawings submitted by Mr. S. B. Curfman, city engineer, September 18th, 1906.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Chapman and seconded by Dr. Stanton to confirm the Board's action approving health officers, appointed to serve in lieu of a board of health.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Chapman and seconded by Dr. Stanton to confirm the Board's action appointing Dr. R. J. Dillery health officer of Miller City, to serve in lieu of a board of health until the second Monday in January, 1908, at a salary of \$35.00 per year.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

It was moved by Dr. Miller and seconded by Dr. Chapman to confirm the Board's action approving the rules and regulations adopted by the health officers of Brinkhaven, Lynchburg and Mt. Sterling.

Those voting in the affirmative were Messrs. Stanton, Chapman, Warner, Palmer, Crossland, Miller and Hartzell.

In the negative, none.

## SECOND SESSION.

Thursday, October 18th, 1906.

The Board reassembled at 9 A. M. on the 18th, all members present except Dr. Miller.

After some discussion of a plan for joint conferences of the State and local health authorities, it was voted to invite the health authorities of all municipalities of 3000 inhabitants and over to meet with the State Board of Health following its regular meeting in Columbus in January, 1907; and that the question of providing for further joint meetings be referred back to the committee for a report at the next meeting.

The president and secretary were charged with the program for the joint meeting in January.

There being no further business, the Board adjourned.

Attest:

C. O. PROBST,

*Secretary.*

QUARTERLY REPORT OF THE SECRETARY.

OCTOBER MEETING. 1906.

*Mr. President, and Members of the Ohio State Board of Health.*

GENTLEMEN:—Your secretary begs leave to offer the following report of the Board's operations since the last meeting, held June 19th. No special meeting was called by the president as there was nothing demanding it.

There has been very little smallpox in the state, only 56 cases having been reported since June 16th; 16 of these being in Cincinnati and 12 in Springfield Township, Gallia County.

There has been an unusual prevalence of diphtheria. A severe outbreak occurred in Meigs and Gallia counties, along the Ohio River. During the month of September 92 cases and 9 deaths were reported in Salisbury Township, Meigs County; and 56 cases and 1 death in Cheshire Township, Gallia County.

Of the 975 cases reported in cities since the last meeting, 358 were in Cleveland.

In accordance with instructions, I have arranged for keeping the Lederle antitoxin on hand, to be furnished to local health authorities. About 7,000 copies of the circular letter, given below, were sent to boards of health, health officers, physicians and newspapers in the state.

Up to this time 19 different boards have ordered the antitoxin, and 31 boards have notified us of their having adopted the order.

Since the announcement was sent out, August 9th, we have distributed 266 curative doses and 242 immunizing doses.

The epidemic in Meigs and Gallia counties had gained full headway before use was made of antitoxin. The health officers and physicians who were in charge of the cases reported that antitoxin may be credited with having very promptly suppressed the outbreak.

The following table showing results in cases in which it was used will be of interest:

CURATIVE DOSES.

Number receiving treatment .....42; deaths, none.

BY AGES.

5 years and under .....	12
6 to 10 years .....	15
Over 10 years .....	15

## TIME GIVEN AFTER ONSET OF DISEASE:

12 hours and under .....	32
12 to 24 hours .....	4
24 to 48 hours .....	5
48 to 72 hours .....	1

## AMOUNT GIVEN:

2,000 units .....	24
3,000 units .....	4
4,000 units .....	9
5,000 units .....	3
6,000 units .....	2

## IMMUNIZING DOSES.

Number receiving treatment, 54; none developed disease.

Size of dose, 1,000 units, 53; 2,000 units, 1.

Time of exposure, 7 hours, 4; 8 hours, 1; 10 hours, 7; 12 hours, 11; 18 hours, 2; 1 day, 10; 2 days, 5; 3 days, 2; 6 days, 1; 13 days, 1; 14 days, 3; and indefinite, 7.

Degree of exposure: Same bed, 16; same room, 22; same house, 5; neighbors, 11.

Following is the circular letter:

## OHIO STATE BOARD OF HEALTH.

## OFFICE OF THE SECRETARY.

COLUMBUS, OHIO, July 1, 1906.

## FREE ANTITOXIN FOR THE PROTECTION OF THE PUBLIC HEALTH.

*To Boards of Health and Health Officers:*

The last General Assembly passed an act authorizing local health authorities to furnish antitoxin free to all indigent persons suffering from diphtheria or exposed to that disease. While this bill passed both branches of Legislature by practically a unanimous vote, through error it failed to reach the presiding officers for signature and for that reason did not become a law. Hoping that authority might already exist to carry out the purpose of the proposed act, the State Board of Health recently submitted the following question to the Attorney-General:

Have local boards of health authority to furnish antitoxin gratuitously to indigent persons, both for the treatment of those afflicted with diphtheria as well as for the prevention of the disease in persons exposed thereto?

In concluding his answer, which will be given in full in the next *Ohio Sanitary Bulletin*, he says:

"I am of the opinion that the expense thereby created is included within the language of Section 2138, R. S., and that the following language, there employed, is not limited to periods of epidemics, viz.:

'And when expenses are incurred by the board of health, under the provisions of this chapter, it shall be the duty of council, upon application and certificate from the board of health, to pass the necessary appropriation ordinances to pay the expenses so incurred, etc.'

"I therefore conclude that, in the event of the prevalence of diphtheria, in a given community, if the local board of health duly adopt an order or regulation to furnish antitoxin for the treatment of indigent persons afflicted with such disease, or exposed thereto, the indebtedness thereby created would be a valid indebtedness of the municipality or the taxing district, in which the same was thus authorized."

It will be noted that to make use of this authority to supply free antitoxin it is necessary for the board of health to pass an order or regulation therefor. The following form, which has been approved by the Attorney-General, is recommended:

#### AN ORDER

Of the Board of Health of ..... to provide for supplying antitoxin free to indigent persons suffering from or exposed to diphtheria.

Section 1. For the protection of the public health it is hereby ordered by the Board of Health of ..... that any indigent person in or residing within its jurisdiction who is suffering from diphtheria, or who has been exposed to such disease, will, upon the request of his or her attending physician, be furnished with antitoxin at the expense of said board of health, in such amount as the attending physician may deem necessary.

Section 2. This order shall take effect and be in force on and after its adoption and legal publication.

Passed.....

.....President,

Attest : .....Clerk.

The words "health officer" should be substituted for "board of health" where a health officer has been appointed by council in lieu of a board of health.

*The State Board of Health must be notified of the adoption of such an order by any local board of health before antitoxin will be furnished.*

#### USEFULNESS OF ANTITOXIN.

No argument is needed in favor of the use of antitoxin in the treatment of diphtheria. It is safe to say that it has reduced the average mor-



tality from this disease by one-half. It has also greatly reduced the duration of the disease in the cases that recover, and thereby the period of quarantine during which the public is more or less endangered.

Of still greater use, probably, is the employment of antitoxin in small doses to prevent the development of diphtheria in those necessarily exposed to it.

In New York City antitoxin was used in 1043 cases of exposure and only 3 of these contracted diphtheria. In Chicago 7051 persons who had been exposed to diphtheria were given immunizing doses of antitoxin, and but 46 of these contracted diphtheria and none of them died.

We would strongly urge the more general use of antitoxin for the prevention of this disease as a wise public health measure. When diphtheria occurs in some poor family, living in close quarters, as so often happens, so that isolation of the sick one is impossible, the best thing to do is to at once inject each member of the household with a small dose of antitoxin. This will give them almost complete protection from the disease for some weeks.

There is little or no danger in this. Antitoxin is now made under the inspection of the national authorities, and its purity is assured.

#### PLAN FOR SUPPLYING AND DISTRIBUTING ANTITOXIN.

In order that boards of health may be able to secure reliable antitoxin on short notice the State Board of Health has arranged to keep a fresh stock constantly on hand, and a supply will be sent at once to any board of health requesting it.

Arrangements have been made with the Lederle Antitoxin Laboratories of New York City to keep the board supplied with their concentrated antitoxin, which is the antitoxin now being used in New York City and many other places. A specially low price has been made to boards of health. It comes in single packages put up in glass syringes ready for use, and will be kept in doses of 1000, 2000 and 3000 units. The price, including the syringe, to boards of health is:

1000 units with syringe.....	\$ .75
2000 units with syringe.....	1.25
3000 units with syringe.....	1.75

#### DOSAGE.

*Immunizing Dose.*—1000 units.

*Curative Dose.*—In light cases, not involving the larynx, if treatment is given on first day of disease, 2000 units will generally be found sufficient; if treatment is not given until the second or third day of the disease, it would be better to give 3000 units. If disease is severe, and in all cases of diphtheritic laryngitis, at least 4000 units should be administered,

while 5000 to 10000 units are often indicated. If favorable results do not follow within eight hours, the initial dose should be repeated or doubled. With refined and concentrated antitoxin, giving a maximum of strength in a minimum bulk, it is safer to give large doses than to risk the danger of an insufficient dosage.

The arrangements for its distribution by the State Board of Health are as follows: Upon the request of any local board of health, or of its health officer, we will at once send by mail or express, prepaid, the number of packages ordered, in the doses indicated. A statement will be sent to the person who orders the antitoxin and a duplicate statement will also be sent to the producer. The latter will collect the amount due for the antitoxin from the local board of health. The State Board of Health will not receive any money, and is simply acting as a distributing agent for the purpose of saving time.

Antitoxin will not be furnished to physicians except upon the order of the local board of health.

It may happen that an outbreak of diphtheria will occur where many persons have been slightly exposed, as in school, for example. The board of health may wish to have a small supply of antitoxin on hand for such an emergency, but may not be called upon to make use of it. To meet such conditions a board of health may order as many as 20 immunizing doses and 10 curative doses, and have the privilege of returning to the State Board of Health within 30 days any unopened packages, for which it will receive credit. The only extra expense, where this is done, will be the postage or expressage upon the packages returned.

In ordering antitoxin care should be taken to explicitly state the number of packages wanted and of what doses. The post office, or express office if a large quantity is ordered, to which it is to be sent, must also be given. When antitoxin is received it should be kept in an ice chest, where possible, until needed.

It should be remembered that the success of antitoxin in the treatment of diphtheria depends largely upon its early use in sufficiently large doses.

Each package of antitoxin will contain a blank for a report of the case in which it is used. Physicians who receive antitoxin from boards of health will be required to fill out this blank and return it to the State Board of Health. They must also certify that the antitoxin was used for a person in indigent circumstances.

Local boards of health are urged to make use of their authority and this arrangement for supplying antitoxin for the cure and prevention of diphtheria. Physicians are frequently called to cases of diphtheria in poor families where the use of antitoxin would mean the saving of life, but where the family is too poor to purchase it. The physician should not be expected to furnish it at his expense. This should be borne by the public for the reason that to lessen the number of deaths from this disease, and

the period of time during which those who recover must be quarantined, and also to protect those who are exposed from having the disease, is a public health measure for which the public can well afford to pay.

Yours truly,

C. O. PROBST, M. D.,

By order of the Board.

*Secretary.*

October 13th Dr. Platter visited Glouster on account of diphtheria.

No other visits have been required by medical inspectors since the last meeting.

Dr. Warner visited Lakeside, Kelley's Island and Put-in-Bay, reference to which is made later on.

Mr. Hartzell visited East Palestine in response to a complaint of unsanitary conditions, made an investigation and report, a copy of which was sent to the local authorities. This will be presented later if desired.

Dr. Stanton visited Elmwood Place relative to proposed sewerage for that place.

Dr. Crossland visited Roseville to investigate an outbreak of diphtheria.

The bacteriologist visited Blanchester to continue the work instituted by Mr. Stabler in the disposal of the waste from the creamery of French Brothers.

The chief engineer visited Beach City, Bridgeport, Brookside, Bradford, Buckeye Lake, Celina, Columbus, Delta, Galion, Lancaster, Milan, Niles, Rittman, Shelby, Toledo, Lebanon and Loveland, on account of sewerage, proposed water supplies or the pollution of streams.

The assistant engineer visited Ada, Bellaire, Brookside, Bowling Green, Buckeye Lake, Caldwell, Carbon Hill, Celina, Delphos, Fostoria, Fort Recovery, Garrettsville, Greenville, Holgate, Jefferson, Lakeside, Lancaster, Lima, London, Loveland, Louisville, Madisonville, Medina, Minster, Mineral City, Morrow, New Philadelphia, Norwood Township, Huron County; Put-in-Bay, Rendville, Tiffin, Versailles, Wellington, Woodsfield and Youngstown.

He also investigated the water supply of the following places: Barnesville, Caldwell, Chillicothe, Freeport, Louisville, Piqua, Murray City, Sandusky and New Philadelphia. A copy of his report was sent to the local officials in each case with a letter and, where necessary, suggestions were made for improvement in the supply or its management.

June 15th the assistant engineer inspected the construction of the London sewage purification plant. His report showed that there were features relative to the construction of the work which should be brought to the attention of the authorities. A letter was addressed to the village engineer setting forth these requirements.

Complaint was made by a citizen of Bellaire, of a nuisance caused by

the discharge of sewage and other wastes into Indian Run. The assistant engineer visited Bellaire June 11th, examined the conditions complained of and made a report, which showed that the nuisance was caused by the discharge of a number of sewers and waste drains into the run, and that it could only be abated by reconstructing the sewerage system, conveying all sewage directly to the Ohio River. A copy of his report was furnished the mayor and council and they were advised that in making such a change it would be important to provide for the sewage being carried directly to a point in the river well below the present water-works intake.

While in Bellaire the assistant engineer also inspected the water filtration plant in process of construction, and upon request of the health officer, investigated the location for a proposed garbage dump in low territory adjoining a small ditch to the south of town. He reported that during periods of high water in the river this property would be inundated, and the health officer was advised that it would be much better for the city authorities to provide for an incinerating plant, as that would be the most cleanly and sanitary method of disposing of their garbage.

The attorney for a number of persons living near Black Fork Creek below Shelby, on June 16th, filed a complaint regarding the pollution of that stream by sewage from Shelby. The assistant engineer visited Shelby June 20th, made an inspection of the conditions complained of, and his report showed that the creek was in a polluted condition, due to a large extent to sewage sludge discharged from the bottom of the settling reservoir at the disposal works, and to the acid wastes from the tube works, which prevent the purification of the sewage. The Shelby Steel Tube Company is now making changes which will enable them to reclaim the acid which is now being discharged into the sewers, thus rendering the wastes inoffensive and enabling them to be discharged into the stream without objection. An interesting report on this will appear in the special water and sewage purification investigation report.

Complaints were again made to the Board in regard to the pollution of Poe Ditch by the sewage of Bowling Green. The assistant engineer visited there July 5th and found conditions to be such as to create a nuisance detrimental to the health and comfort of those living in the vicinity. In 1900 the Board approved plans for a new system of sewers for Bowling Green subject to the conditions that the sewers then in use be abandoned for carrying house drainage, and that provision be made for purifying the sewage, in a manner satisfactory to this Board, within three years' time from the completion of the main outlet sewer.

These conditions were never complied with and as the sewage is causing a nuisance the matter was referred to the Attorney-General, who advised that it is the duty of the city to construct the entire sewer system in accordance with the conditions prescribed, and that these conditions could be enforced by mandamus or injunction. I notified the board of public service and the mayor and council that the Board felt that relief



should be given those who are justly making complaints, and that the time had come when the Board must insist upon compliance with the conditions of its approval of their plans in 1900. I met with the officials at Bowling Green August 6th, and one or two members of council and the mayor admitted that their sewage is the cause of a nuisance and a disposal plant ought to be built as soon as possible. It was claimed, however, that no money was available at this time for such an improvement.

I examined the Poe Ditch while there. It had been recently cleaned out and recent rains had well filled it with water so that no nuisance was being created at that time.

June 13th the health officer of Kelley's Island called the Board's attention to the unusual amount of typhoid fever there and requested an investigation. The assistant engineer visited Kelley's Island June 22d, and reported that there were four separate private water supplies which furnish the people of the island with water. Typhoid fever could only be traced to the pollution of one of these supplies, that of the Kelley's Island Lime and Transport Company, the north side supply, yet all four are in danger of pollution to a greater or less extent. He advised the relocation of the intakes. Later Dr. Warner visited the island and had a conference with the officials in regard to this matter. Mr. J. H. Pellett, superintendent of the company, as a result of this conference, has expressed a willingness to make changes in the supply and has requested, recently, a conference with the engineer.

June 21st the assistant engineer visited Lakeside for the purpose of investigating the general sanitary conditions which exist at that resort, especially as relate to the public water supply and sewerage. He reported that the general appearance of the resort was good, but that the public water closets were in an unsanitary condition, and that there was a lack of care in cleaning private vaults. He stated that the bathing beach was immediately west of the wharf at the end of which the sewage of the village is discharged. Since his report was made complaints have come regarding the pollution of the bathing beach and the township health authorities were advised that they had authority to prevent bathing at this place as it would be dangerous to bathe in such water. Dr. Warner, at the time of his visit to Kelley's Island, conferred with the Lakeside authorities. They requested an estimate of the cost of new and adequate water filters and promised to make every endeavor to add this improvement next season.

June 24th the assistant engineer visited Put-in-Bay to determine whether the sanitary conditions had been improved. He found that practically all the objectionable conditions occur on the shore and about the hotels and places of amusement, where the great majority of visitors, especially excursionists, congregate; the places which depend upon the patronage of visitors for their support. The owners appear to be indifferent to the matter, not realizing the necessity of an improved water supply and

sewerage system, and it would appear that unusually coercive measures are the only means of obtaining needed improvements.

Dr. Warner also conferred with the authorities of Put-in-Bay regarding necessary improvements. Since then the council has passed an ordinance to submit to a vote the issuing of bonds for \$12,000 for new water works. They promise also to adopt an ordinance for sewerage. The mayor has asked the Board to be represented at a mass meeting to be held prior to the election, to consider these matters, and I have requested the president to be present, if possible, and have arranged for the chief engineer to be there.

June 30th, Dr. Chapman met with the mayor and board of public service of Toledo, relative to complaints of a nuisance caused by foul odors coming from the garbage disposal plant in that city. The matter had been referred to the health officer, who had in turn referred it to the State Board of Health. Dr. Chapman reported that there was an odor from the stack which was unpleasant but not of a foul character and advised that suit be brought by the city solicitor, or by the prosecuting attorney, for the abatement of the nuisance. A letter was addressed to the board of public service calling their attention to the provisions of Section 6920a R. S., authorizing the county commissioners of any county to appoint an inspector of nuisances, who thereby becomes vested with police powers and is authorized to institute prosecution against whoever erects or maintains any building or place for the exercise of any trade, employment or business, which by occasioning noxious exhalations or offensive smells becomes injurious to the health, comfort or property of individuals.

Repeated complaints were made to the Board of the unsanitary conditions existing on the property of Henry Feldman at Minster. The assistant engineer visited Minster July 7, and reported that the complaints were well founded and the nuisance should be abated. A copy of his report was sent to the health officer with the request that he take the necessary action to have the nuisance abated so far as possible.

While at Minster on July 7, the assistant engineer investigated the unsanitary conditions caused by an improperly constructed storm sewer, recently built by the commissioners of Auglaize County, discharging into the Miami and Erie Canal. He reported that the ditch intended to carry the drainage from a considerable area into the upper end of this sewer was so filled up that proper drainage through it was impossible, and unsanitary conditions were caused by the flooding of a certain portion of the village periodically. The commissioners were notified that this storm sewer should be continued in a westerly direction to such a point that the drainage may readily enter it; or the ditch properly cleaned and graded so that it will readily convey the drainage to the storm sewer.

The health officer of Jennings Township made complaint of objectionable conditions attributed to a garbage dump formerly used by the



village of Delphos; and also of the pollution of Jennings Creek by the sewage from that village. The assistant engineer made an investigation on July 6, and reported that the pollution of the creek appeared to be due not to the sewage from the village, at least to any great extent, but to the discharge, through one of the storm water sewers, of the waste material from a straw-board works. The board of trustees of public affairs of Delphos was notified that it had authority to prohibit the discharge of waste matter through any of the village sewers, and thereby escape the responsibility for the pollution of the creek. A copy of the engineer's report was also sent to the health officer of Jennings Township, and he was advised that the people living along the creek, or the board of health, could bring action against the straw-board works for the pollution of the stream. His attention was called to the unsanitary condition of two slaughter houses in his township, as noted in the report.

The Board was asked to investigate a nuisance caused by the pollution of Champion Creek by the sewage and contents of cesspools at Medina. The assistant engineer made an investigation July 13 and reported that a nuisance undoubtedly existed, the cause being that not enough water ran in the creek to dilute the sewage. A copy of the report was sent to the mayor and his attention was called to the fact that the only remedy would seem to be the construction of a system of sanitary sewers, with the abandonment of cesspools and all house connections with storm sewers. The Board recently approved a system of sanitary sewers with sewage disposal for Medina, and inquiry was made as to what steps are being taken toward the installation of such a system. The mayor replied that council expected to take action on the plans for sewers and sewage disposal at its next meeting.

Complaint was made of the pollution of a small stream in the village of Brookside by the waste from a slaughter house. The assistant engineer visited Brookside July 11 and made a report to the effect that the stream was badly polluted and the owners of the slaughter house should install and operate some system for purifying the waste water from their plant, such as filtration through sand, coke, coal or similar materials, before discharging it into the stream. A copy of the report was sent to the owners of the slaughter house and the assistance of the Board offered in making plans for carrying out the improvement recommended by the assistant engineer. They expressed themselves as willing to carry out the recommendations but upon a second visit the engineer found that they had done nothing towards carrying out his advice.

This case and the one at Minster bring up a matter of much importance, and one that has been a source of constant annoyance to this Board for twenty years. The complainant in the Brookside case was Judge Driggs, a prominent lawyer and member of the State Sanatorium Commission. He lives near this slaughter house and is greatly disturbed

by it. He tried to get the local health authorities to compel the owner to abate the nuisance but without avail. He is unwilling to bring a private suit, and told me he would have to abandon his home at a sacrifice unless the State would aid him.

The complainant at Minster is a poor ignorant German, who has suffered for years from a nuisance the local authorities will do nothing to abate.

Should the State abate local nuisances? I presented this question at a conference of State Boards of Health and the opinion, without dissent, was that it should not. I should like to know the Board's opinion as to amending Section 6920a. This section authorizes the county commissioners to appoint an inspector of nuisances who has authority to abate most of the nuisances complained of. The prosecuting attorney is his legal advisor, and may be allowed compensation for services, an important point. The law might be changed to make it mandatory for the commissioners to appoint such an inspector when required by the State Board of Health. I have studied over this a good deal, but am not prepared to advise it.

Another matter I have in mind in this connection, though the Legislature does not meet for some time, is for the Board to appoint an inspector of nuisances. We could not do it now with our appropriation. The assistant engineer is doing much of this work now. He has plenty of work in connection with sewerage and water supplies, and a cheaper man could inspect nuisances.

August 31st, the assistant engineer made an investigation of the slaughter houses of Lancaster and reported them to be in a generally poor condition and maintained in a slovenly manner. He stated that it would be highly desirable to have rules and regulations drawn up for their proper construction and maintenance and for their location at a reasonable distance from the built up portion of the city. A copy of his report was sent to the health officer and the board of health was advised to give the matter attention.

A petition was received from the South Side Business Men's Improvement Association of Columbus, complaining of the unsanitary condition of the canal at the foot of Main Street, Columbus. On July 19, the chief engineer, in company with the health officer of Columbus and the chief engineer of the State Board of Public Works, visited the place and made an investigation. It was found that the canal was receiving the overflow from the city sewers, sink drainage and all kinds of rubbish and filth, and the conditions thereby created were most offensive and a menace to health. A letter was addressed to the State Board of Public Works advising that the canal at this place be filled with inoffensive earth, as the most practicable means of abating the nuisance. They stated that they had no funds for filling the canal, but agreed to allow the city to do it.

The mayor of Galion requested the Board to make an investigation of the sanitary conditions of the village with respect to sewerage. August 1, the chief engineer made an inspection and a copy of his report was sent to the mayor, the gist of which was that the sanitary condition of Galion as regards the disposal of its sewage and other waste matters is most disgraceful and is a constant source of danger to the health of its inhabitants, and the city council should at once take steps toward procuring detailed plans and specifications for a sewerage system and sewage disposal plant, satisfactory to the State Board of Health and then take steps toward raising necessary funds to pay for their installation. It was also stated that if the authorities were unwilling to act the only way to remedy the pollution of Pickle Run and Whetstone Creek by this sewage would be for the people living along the stream to bring injunction proceedings.

It was learned that the village of West Milton had installed several sewers and outlets without the Board's approval, and the assistant engineer was sent there to make an investigation. It will be remembered that this village installed water works without securing the Board's approval. The engineer's report indicated that the sewers were already giving trouble because the outlets are not extended into the current and submerged. A letter was addressed to the board of trustees of public affairs, advising that, before undertaking any extension of the sewers, they should secure the services of a competent engineer to prepare plans for a comprehensive sewerage system for the village, which would also provide for collecting the sewage at some point below town where it can be properly purified when this becomes necessary, and that any extension of the present sewers should be approved by the State Board of Health.

One of the assistant engineers, while in Wooster, investigated a complaint made of a nuisance in Wooster Township, Wayne County. He reported the nuisance to be due to odors arising from algal growth which covers a mill race, stagnant ponds being caused by the damming up of one end of the race by the accumulation of silt coming from storm water sewers.

The trustees of Wooster Township, Wayne County, were notified that an opening should be made for the water to flow through and thereby remove the stagnant ponds.

It came to the attention of the Board that the city of Lancaster was replacing an old sewer in 5th Avenue with a new one and had not secured this Board's approval. The chief engineer visited Lancaster July 24, and found that the work should come before the Board for approval. A letter was addressed to the board of public service, calling their attention to the requirement and stating that the Hocking River at Lancaster had for some time been badly polluted and that in all probability purification works would have to be installed within a few years,

and the reconstruction of this sewer was not in accordance with plans which would tend to make such purification of the sewage feasible. They were advised to correct these conditions by placing a small domestic sewer, 8 or 10 inches in diameter, over the 36-inch sewer which is now being laid and connect all buildings to the small sewer. They were also asked to submit plans embodying this arrangement. This communication was apparently unheeded and construction is now under way in accordance with the original plans and no provision is being made for separate sanitary sewers. The sewer in question is 3 feet in diameter, 2,850 feet long, of concrete sewer pipe, and is to cost \$8,841.50.

July 26th, the assistant engineer visited Woodsfield, examined the public water supply and made a report. A letter was addressed to the mayor and council, setting forth certain features which, from the report, should receive the attention of the proper authorities.

It was found that the impounding reservoir was being used for fishing purposes in direct violation of the action of the State Board of Health. The principal owner of the water-works, who is responsible for this, was notified. Judge Driggs, who is attorney for the fishing club, sent me the following communication in regard to this, and asks that fishing privileges be continued:

BRIDGEPORT, O., October 10, 1906.

DR. C. O. PROBST,

*Columbus, Ohio.*

DEAR SIR: — Herewith I enclose you agreement relative to Woodsfield Water Company, by which certain parties are authorized to fish in dam from which water supply is furnished to the village of Woodsfield and also letter which I received from the president of the water company.

I can say to you and the Board of Health that every word contained in the letter is absolutely true. The gentlemen forming this water club are among the best men in Woodsfield; are the patrons of the water company and use the water for domestic purposes and otherwise, and consequently have a great interest in having the supply pure and unadulterated.

The contract, which I herewith enclose you, is the original and after showing the same to the Board of Health, I will ask you to kindly return the same.

Yours very truly,

J. B. DRIGGS."

July 27th, the assistant engineer investigated the public water supply of Caldwell. His report showed that their well supply is being supplemented by water taken from Duck Creek and that this additional source was never approved by the State Board of Health. The report also showed that Duck Creek is liable to pollution and unsuitable for a public water supply.

The authorities were advised to abandon its use at the earliest possible time and to look for an additional supply of satisfactory quality from ground sources. They were further advised to make an inspection



of all private wells and to condemn those found to be polluted. The assistance of the Board was offered in the way of examining a limited number of samples from these wells.

July 30th, the assistant engineer investigated the water filtration plant being constructed at Fostoria and made a report.

July 31st, the assistant engineer visited Holgate for the purpose of investigating complaints in regard to the water supply. His report showed that this supply had been installed in 1901, without submitting plans to the State Board of Health for approval; that the water is safe as regards dangerous pollution and that the complaints were due to the sulphuretted hydrogen in the water, which gives it an unpleasant taste and odor. A letter was addressed to the secretary of the water-works, setting forth certain changes which should be made to improve the supply.

August 2nd, the assistant engineer visited Jefferson to make an examination of a proposed public water supply, and made a report. A letter was addressed to the mayor, advising that the authorities endeavor to find a water of better quality than that shown by the examination. No definite plans had yet been drawn.

August 6th, the assistant engineer visited Wellington to inspect proposed sewerage work and made a report. He found that the proposed sewer is to connect with an existing sewer and that it will be entirely unsuitable to receive domestic sewage of any kind.

The village authorities were notified of this fact and of the importance of council's adopting and enforcing rules forbidding the use of this sewer for domestic purposes; and it was suggested that the question of constructing a system of sanitary sewers with carefully cemented joints and provision for disposal works should be given early consideration.

August 16th, the assistant engineer inspected the sewerage system of Celina with special reference to the necessity of purifying the sewage. His report showed that the plans for sewerage and sewage purification approved by the Board in 1901 were abandoned and that storm sewers, involving a new outlet, were constructed, that these sewers receive considerable domestic waste and discharge into an open ditch without purification.

The board of trustees of public affairs were notified that they should regulate the use of all sewers and should at once stop the discharge of domestic sewage into these newly constructed storm sewers. The hope was expressed that the village would take up, at the earliest possible time, the matter of constructing proper sanitary sewers with sewage purification, either in accordance with the plans already approved by the Board or, if considered desirable, other plans which should also be submitted to and approved by the State Board of Health.

Later, at the urgent request of Mr. Godfrey, a former member of



Legislature, the chief engineer inspected a nuisance at Celina caused by the discharge from a large canning factory at that place. The local health authorities were notified of conditions found and asked to have the nuisance abated. Mr. Godfrey was furnished with a copy of the engineer's report, and was cited to the law authorizing the county commissioners to deal with the case should the local board of health fail to act.

July 31st, upon the request of the local health authorities, the assistant engineer investigated a nuisance at Tiffin, caused by the discharge of sewage and oil well waste into Gibson Run. From his report it was evident that the run is badly polluted and a just cause for complaint on the part of those living near it.

A copy of the report was furnished to the health officer of Tiffin, and he was notified that the board of health should enforce an order prohibiting the discharge of oil well wastes into the stream and requiring the county infirmary and the St. Francis Home to adopt some system of sewage purification which will meet the approval of the State Board of Health.

The assistant engineer also investigated a nuisance caused by the discharge of refuse and sewage on the bank of the Sandusky River from farm buildings owned by Joseph Harder. The health officer was notified that the board should require proper plumbing for this property and a waste drain with connection with the public water supply, so that proper flush closets could be introduced, and thus do away with this nuisance.

The solicitor of Morrow requested the Board to make an investigation of the sanitary condition of the village and the assistant engineer visited Morrow on August 24 for that purpose. A copy of his report, with a letter of advice, was sent to the health officer, and the board of trustees of public affairs was also advised that it should consider the advisability of installing a public water supply from a source which would guarantee its purity, as the investigation developed that many of the wells are located quite near privies and cesspools and are therefore liable to serious pollution at any time.

August 27th, the assistant engineer, in response to a request from the clerk of Norwalk Township, Huron County, investigated a nuisance at Willow Brook Park. The report showed that the occupants of the park discharge sewage into Willow Brook Lake with the result that very objectionable conditions are created. A copy of his report was sent to the township authorities and they were advised to adopt an order requiring the owner of the park to put in properly constructed vaults, so that it would be impossible for any sewage to gain entrance to the lake.

A copy of the assistant engineer's report was also furnished the owners of the park.

August 21st, upon request of the State Board of Public Works,

the assistant engineer, in company with the president, the engineer of that Board and representatives of the Walnut Township, Fairfield County, and Union Township, Licking County health authorities and a delegation of lessees of State land, visited Buckeye Lake.

The State Board of Public Works proposes to introduce such improvements from time to time as will render this resort more attractive. Among the many problems requiring attention are the re-enforcement of embankments, the drainage of mosquito breeding swamps, the prevention of the growth of plants in the lake which on decaying emit disagreeable odors, and the removal of stumps and other obstructions to navigation. They decided to devote their attention first to those conditions that most directly influence the healthfulness of the locality and to safety of the reservoir embankments.

It was proposed to construct a sewer, with outlet into the south branch of the Licking River, but that was abandoned on account of the expense and the nuisance that would probably be occasioned during low water.

A copy of the assistant engineer's report was sent to the president of the State Board of Public Works with a letter stating that the best plan for caring for the present sewage of Buckeye Lake Park and cottages appeared to be by means of private vaults carefully constructed and maintained according to rules set forth in the report; and that stagnant water which forms breeding places for mosquitoes should be drained as a means of doing away with this nuisance. They were also informed that the copper treatment, suggested as a means of getting rid of the vegetable growths in the water would probably not be successful.

Matters acted upon by mail should now be confirmed, and it will probably be necessary for the Board to approve the order adopted by the health officers, serving in lieu of a board of health, providing for free antitoxin for the indigent who have contracted or who have been exposed to diphtheria. The health officers of the following places have adopted such an order: Byesville, Corning, Elmore, Mt. Gilead, St. Clairsville and West Farmington.

Respectfully submitted,

C. O. PROBST,  
*Secretary.*



# PUBLIC WATER SUPPLIES.

(77) .





REPORT ON PRESENT AND PROPOSED WATER SUPPLY OF  
AKRON.

For the purpose of inspecting a proposed new additional water supply for Akron, the assistant engineer visited that city on January 19, 1906, and the following report was made:

The city of Akron is in the northeastern part of the state and lies just north of the great divide in hilly country. The area of the city is 11.2 square miles.

The present population of the city is in the neighborhood of 50,000. The main industry is the manufacture of rubber, though there is a paper mill, a machine works, a cereal food factory and several other smaller establishments.

The present source of water supply is from Summit Lake just southwest of the city, and from one small well.

In the outlying districts of Akron numerous springs and wells are still in use and in the western part of the city the Cold Spring Water Co. delivers water to a number of consumers through a system of pipes. This water is delivered in small quantities and is used for drinking purposes only.

## HISTORICAL.

The Akron water-works was first installed in 1881. The first supply was drawn from a large receiving basin 50 feet in diameter and 35 feet deep at the pumping station. There were four or five wells supplying this receiving basin and were driven in the bottom of the basin to a depth of 60 to 70 feet. The wells flowed and were expected to keep the basin full. However they soon proved insufficient. All but one of these wells were subsequently filled up. Water from the remaining well is said to still enter the basin but only when the water level is quite low.

In about 1885 a 10-inch vitrified pipe line was laid to Summit Lake and practically the whole supply was drawn therefrom. This water proved undesirable in quality and more or less complaint was raised against it. In 1891 the Cook Well Co. drove some 30 wells in the small valley back of the pumping station and extended toward what is now known as the Water-works Park. Only seven of these wells gave satisfaction and the rest were all abandoned. Until 1894 the seven good wells were used to furnish the entire supply and were pumped with compressed air. In that year the quantity of water to be derived from the wells proved insufficient and Summit Lake was again sought as a source of supply. A 30-inch riveted steel pipe was laid connecting both Summit Lake and Mannings Pond with the pumping station. Mannings Pond, which is a small spring-fed basin with an outlet to Summit Lake, was used for several years but owing to the great number of fish therein, had to be abandoned. These fish could not be prevented from clogging the

mains. Permission for dynamiting the fish was sought of the State Fish Commission but was not granted. The connection to this pond is still in place and may be used in emergency. Until somewhat over a year ago the seven wells and Summit Lake were used together, the wells furnishing two-thirds of the entire supply. Since then the wells have been abandoned for the sake of saving the extra power required for the air compressor and Summit Lake has been used alone. In September of 1904 the problem of securing a well supply was again taken up. After driving several test wells it was decided to drive all the wells in the plot of land known as Water-works Park. About 30 wells have been driven to date and the few tests so far made seem to indicate an ample capacity for furnishing the entire supply. As the water in these wells rises nearly to the surface of the ground it is proposed to conduct the water to the pumping station by gravity through a wooden stave pipe.

#### SOURCE OF SUPPLY.

The principal source of supply is Summit Lake and it will be described first. This is a natural lake but its level has been raised several feet by the Ohio Canal feeder. The present area of the water surface is about 65 acres. The watershed of this lake itself is small and is not precisely known, however the combined watershed of this and other lakes and reservoirs fed by the Tuscarawas River and forming the main supply for the Ohio Canal is about 89 miles in area. Summit Lake is said to be from 50 to 60 feet deep in its deepest parts but so far as could be learned from the State Board of Public Works no systematic soundings have ever been made. The lake is also fed from numerous springs in the bottom but the quantity of water from these cannot be approximated. The water in the lake is very likely frequently changed since the Ohio Canal flows directly through it at the rate of about 40 cubic feet per second or 22,600,000 gallons per day. The system of lakes and reservoirs alone referred to has ample capacity for supplying both the canal and the city water-works. The bottoms of the reservoirs and the flooded portions of the lakes have never been stripped of loam or vegetation and as a result there is much rank growth of plants which frequently imparts disagreeable tastes and odors to the water. The soil on the watershed is generally sandy or gravelly and the country is undulating to hilly. No estimate of the population on the watershed can be given but for the most part it is but sparsely settled. Of late years numerous summer parks have sprung up on the shores of the lakes and there is considerable boating in the summer time. Near the inlet to Summit Lake are a salt refinery and rubber works. The former introduces large quantities of brine into the lake but not in sufficient quantity to render the water objectionable from this cause. The rubber works maintains a drain into the canal but it is said to be used for the discharge of condenser water only. On the east

side of the lake and nearly opposite to the water-works intake is the works of the Wellman-Seaver-Morgan Co., employing 380 hands. The sewage from the entire plant flows through several settling tanks and then into the ditch which leads through marshes about 500 feet to the lake. The sewage as it appears in the ditch is quite fresh and has a strong sewage odor; though it is likely that little of this sewage reaches the water works intake since the main current through the lake passes between it and the point at which the sewage is discharged, yet when the wind is blowing in a certain direction pollution could easily be conveyed to the intake. Aside from the surface drainage from several summer parks and dwellings on the banks, the Wellman-Seaver-Morgan Company's sewage forms the only serious direct pollution.

#### PROPOSED NEW WELLS.

The proposed new wells as stated above are all located in the Water-works Park. They all have 10-inch steel casings and are partially driven and partially drilled. The wells vary in depth from 85 feet to 150 feet. At the time of examination 29 wells had been driven. The nearest buildings to the wells lie to the south on rising ground within 250 feet of the nearest wells. These are two small dwellings having privies. The privies are within 200 feet of the nearest wells. Four hundred feet distant to the southeast is a large school house from which all sewage and drainage goes into the city sewers. No other buildings are within 500 feet of any of the wells. Below is given the log of well No. 24 which is typical of all the other wells:

22 feet of muck,  
10 feet of yellow sand,  
47 feet of clay,  
5 feet of gravel.

The last stratum is water-bearing and none of the wells have reached the bottom of it, indicating that it is at least 60 feet in thickness. No other wells drilled in the neighborhood, excepting those drilled in 1894, reach the same stratum and there is no indication as to which direction the ground water flows, but it seems barely possible that this sand deposit is in the channel supposed formerly to carry water from Lake Erie into the Ohio River basin. The water in all the wells rises to within 18 inches of the surface of the ground. The pumping test on wells Nos. 10, 11 and 12 discharging freely 10 feet below their normal water level gave a capacity of 324.5 gallons per minute. Other wells nearby were affected but the greatest recession was not over four feet. It is expected to obtain an average of 100 gallons per minute from each well when all are being pumped together. The pumping tests so far as made do not indicate a yield of this amount with certainty.

## EMERGENCY SUPPLIES.

There is at present only the Manning Pond emergency supply. It is probable however that both Summit Lake and Manning Pond will be retained as emergency supplies after the new wells have been placed in service.

## COLLECTING OR IMPOUNDING WORKS.

The present intake at Summit Lake is believed to be simply a cast iron pipe laid out into the lake a distance of 700 feet. No one connected with the company remembers how this was constructed. On the shore of the pond is a small gate chamber where the conduit may be opened or closed.

In the case of the new supply all wells are to be connected up with a system of collecting pipes placed 10 feet below the normal water level in the wells; these pipes will conduct the water to a central collecting well built of brick, plastered with cement mortar and made water tight with asphaltum. This well will be 20 feet in diameter and about 30 feet deep. From the collecting well the water will be conducted to the pump well at the pumping station through a 36-inch wooden stave pipe. All wells are to be covered and carefully protected from accidental pollution.

## DISTRIBUTION OR EQUALIZING RESERVOIR.

Southwest of the city and on a high hill is a distributing reservoir which receives the overflow of the distributing system. This reservoir is 432 feet long, 208 feet wide at the high water line and has a depth of 12½ feet. The sides are of concrete and have slopes of 1 to 1. The bottom is of stone flags and laid in Portland cement. The capacity of this basin when full is 4,000,000 gallons. Water entering the reservoir must fall over the top of a standpipe some 30 feet high so that during hours of heavy pumping the pressure in the mains is somewhat greater than when pumping is partially discontinued. The water flows out of the reservoir through a check valve back into the distributing system.

## PUMPING AND MACHINERY.

The pumping station is located in the southwestern part of the city on Wooster Ave. The water from Summit Lake as has been stated before, is brought to the pumping station through a 30-inch riveted steel pipe. Before passing into the receiving basin (also previously described) it passes through a small grit chamber where the heavy matter in suspension is settled out. This grit chamber is of brick construction and is loosely boarded over at the top. The pumps draw directly from the receiving basin. The pumping machinery consists at the present time of the following:

1 Worthington compound duplex pump, capacity, 1,500,000 gallons per day.

1 Worthington compound duplex pump, capacity, 3,000,000 gallons per day.

1 Holly triple expansion duplex pump, capacity, 10,000,000 per day.

Either or both of the Worthington pumps are used at night and are augmented by the storage reservoir west of the city. Steam is supplied by three Weeks water tube boilers and one Sterling water tube boiler.

#### QUALITY OF WATER.

The water supply has never been very satisfactory and from time to time has given rise to vehement complaints on the part of the users. The Ohio Canal Commission and the State Board of Public Works have avoided to a large extent the direct sewage pollution of the supply but some manufacturing wastes and sewage, as before noted, still find their way into the canal and Summit Lake. Due to the large amount of organic matter in the reservoirs tastes and odors have been frequently imparted to the water by growth of microscopic organisms. The typhoid death rate has not been excessively high as indicated by the accompanying table, but is sufficient, however, to indicate (keeping in mind the known sources of pollution) that the supply is a dangerous one. The water company is making every effort to improve the conditions. The new wells which are now being driven furnish, according to the chemists report, a water quite free from immediate or past pollution, though containing a considerable amount of incrustants which will cause trouble when the water is used for boiler purposes.

Samples were taken from wells Nos. 3 and 26. The first well No. 3 sample was collected on January 19th after the well had been pumped with a hand pump for 3 hours. The second well No. 3 sample was collected on January 31st after two hours pumping. Sample from well No. 26 was collected January 31st after one-half hour pumping. (For analyses see Laboratory Report on Water Supplies.)



TABLE SHOWING TYPHOID FEVER DEATH RATE.

Year.	Population.	Total Deaths.	Total Deaths per 100,000 Population.	Deaths Typhoid.	Deaths from Typhoid per 100,000.	Cases of Typhoid.
1889	26,000	299	1150	1	4	....
1890	27,601	482	1745	0	0	....
1891	29,000	372	1280	1	3	....
1892	30,500	460	1510	0	0	....
1893	32,000	433	1350	2	6	....
1894	33,600	456	1355	9	27	....
1895	35,100	397	1130	17	48	....
1896	36,600	401	1095	8	22	....
1897	38,100	443	1160	6	16	....
1898	39,600	470	1185	4	10	....
1899	41,100	....	....	....	....	....
1900	42,728	444	1040	6	14	....
1901	44,000	457	1040	11	25	....
1902	45,500	502	1100	14	31	....
1903	47,000	524	1115	18	38	....
1904	48,300	585	1210	15	31	82
1905	50,000	557	1115	14	28	83

## DISTRIBUTING SYSTEM.

The area covered by the distributing system is said to be 12 square miles and the number of miles of distributing mains is 74 miles. There are 7,000 services in place of which 5,700 are in use. All services are made of extra strong lead pipe. There are 365 meters in use and it is intended to introduce them on all services as soon as possible. Mains are flushed regularly twice per year.

The number of persons using the water supply for any purpose is estimated at 35,000, those using it for drinking and cooking 15,000, number of persons accessible to supply at 40,000.

Factories and other large consumers take water from the canal for use in process of manufacture. One paper mill uses the city supply occasionally in the manufacture of certain grades of goods.

Average daily consumption.	Average daily consumption per person using.	Average daily consumption per service.	Average daily consumption per capita.
7,000,000	200	1225	140

## OWNERSHIP AND MANAGEMENT.

The Akron water-works are owned and operated by "The Akron Water-works Co." The company was granted a perpetual franchise, the city reserving the right to purchase the plant at the end of every five year period. The franchise provides that the water company shall furnish a "pure and wholesome" supply of water.

The only rules and regulations for the protection of the Akron water supply are those made by the Ohio Canal Commission, which provide that no sewage or injurious wastes of any sort shall be discharged into the canal or reservoir above the water-works intake. These rules have been but indifferently followed. The water company has recently made private inspections from time to time and has done what it could to have the nuisances removed. No provision is made for having analyses made of the supply.

## ACTIONS OF THE STATE BOARD OF HEALTH.

On June 24, 1901, the city council made formal complaint to the State Board of Health regarding the condition of the water supply. The member of the Board at Canton was appointed a committee to make an investigation and reported the following conclusions:

1. That although the present odor of the water is bad—almost as bad as that at Saratoga Springs and some other noted health resorts—there is in it no present menace to health.

2. That the agreement of the Akron Water Co. and the local health board to rectify the evil has been made in good faith by responsible parties and will be carried out.

"To the 'Whereas' of the council asserting that 'The local board of health of our city has wholly ignored this important question' it is proper to say that exactly the contrary is true."

This report was approved by the Board and a copy of it was sent to the city council of Akron July 30, 1901.

\* On December 28, 1905, the Akron Water-works Co. made application to the State Board of Health for the approval of a proposed additional supply from driven wells. The assistant engineer made an examination of these wells as described in this report.

February 17, 1906, the State Board of Health approved, as a new or additional source of water supply for the city of Akron, driven wells to be located in the water-works park on land owned by the water company, provided,

- 1st. That no well located within 200 feet of any house, building or possible source of contamination, be used; and that the water company buy or obtain control over a sufficient area of land so that it will not be necessary to locate any future well within this distance of any source of contamination.

2nd. That the sanitary condition of all houses within 500 feet of any land upon which wells are located be regularly inspected, at least once a month, by the water company and the co-operation of the local board of health be asked, when necessary, in order to correct any improper conditions.

The superintendent of water-works was advised that on account of the iron contained in the proposed supply the water would doubtless be objectionable to a large number of persons and these persons might use private sources which were contaminated; that the Board, therefore, strongly advised the water company to install means of removing the iron from this water if it were to be used as the public supply; and that from the information which the State Board of Health had received it would seem that better ultimate results both as to quality and quantity would be secured by installing a filtration plant to purify Summit Lake water rather than to attempt to obtain enough water to supply the city's needs from the ground. The lake water would be softer, a distinct advantage to manufacturers.

He was also advised that the entrance of water from an old driven well into the present pump-well, might be causing contamination of the public water supply and that on account of the thickly populated district in which said driven well was located this well should be disconnected from the pump-well as soon as possible; that the water of Summit Lake and hence the present water supply of Akron being contaminated by the sewage from the Wellman-Seaver-Morgan Company's factory, immediate steps should be taken to cut off this pollution even though it was expected to abandon Summit Lake within the year.

The board of public service and health officer of Akron, as well as the superintendent of water-works, were notified that under the statutes the board of public service had ample power to prevent such pollution; and that filtration would be the only means of rendering the Summit Lake water satisfactory.

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## REPORT ON PRESENT AND PROPOSED WATER SUPPLY FOR CANAL FULTON.

The assistant engineer on January 19, 1906, visited Canal Fulton made an examination of the water supply of that village with the following report:

The village of Canal Fulton is in Lawrence Township in the north-western portion of Stark County and has a population of 1,200 to 1,300 people. The Tuscarawas River and Ohio Canal pass through the village. The locality is quite hilly, the hills rising to several hundred feet on both sides of the river valley. Numerous springs flow from these hills, and it is from a group of such springs that the public water supply is drawn.

Some years ago when the canal was largely used for transportation of grain, the village was a flourishing farming center. At the present time the farming business is of small proportions and the village is mainly given up to the houses of miners employed in neighboring coal mines.

As it at present exists the water supply is drawn from springs and a farm house well and is collected in a storage reservoir from whence it flows by gravity to the village.

#### HISTORICAL.

The water supply was placed in operation early in 1902. The supply was at first drawn from springs emerging near the top of the hills west of the village, but these not proving of ample capacity, were supplemented by a well belonging to a nearby farm house. It is now proposed to drive additional wells to tide over the times when consumption is greatest.

#### SOURCES OF SUPPLY.

The location of the springs is just outside of the corporation line and west of the village. They emerge in a small depression or valley in the range of hills on the west side of the valley of the Tuscarawas River. The water from these springs is collected in five wells, each six feet deep and made of three lengths of 24-inch vitrified pipe open at the bottom and covered at the top (which is even with the ground level) by boards laid closely together. The water from the wells is conducted to the storage reservoir through an 8-inch vitrified pipe. The hill above the wells has no population within half a mile. To the north side of the small valley and on the top of a steep slope rising from it is a farm house not over 100 feet distant. The farm house is in such a position, however, that drainage from it could hardly reach the springs.

The well which forms an auxiliary supply is back of and on the same level with the farm house. It is driven to a depth of 47 feet with a steel casing, and is said to pass through gravel, shale and into water-bearing sand. The farm house and small outhouses closely surround the well and the neighboring ground receives more or less sink wastes. Forty feet from the well in the the opposite direction from the springs, is a privy made by digging a hole in the ground. This privy evidently acts like a leaching cesspool for it has not been cleaned for three or four years. The surface of the ground at the privy is slightly lower than that about the well but it is quite possible that subsurface flow may be from the privy toward the well. The well is pumped by a windmill and the water is conveyed by a vitrified pipe to the storage reservoir.

At the time of the examination one well was begun and it is proposed to drive others. These are to be located at a lower level than the springs and the other well and near the storage reservoir. The number to be driven has not yet been decided upon. They will all have steel casings

3 or 4 inches in diameter. These wells are to be used in the nature of an emergency supply and are to be pumped by means of a small gasoline engine and power pump at times of fire or when the springs and wells fail to give a sufficient yield for the regular supply.

#### DISTRIBUTING RESERVOIR.

The storage reservoir above referred to is built of concrete and is 100 feet long by 20 feet wide and 14 feet deep. The walls of the reservoir are one foot to 18 inches in thickness and the bottom is about 4 inches in thickness. The foundation is on solid rock. The basin is covered with a substantial wooden building, which admits practically no light. At time of examination the water in the reservoir was two feet deep. High water in the reservoir is said to be 150 feet above the main portion of the village.

#### QUALITY OF WATER.

The water from the springs is of very good quality from a sanitary point of view, as shown by the appended analysis; the hardness is also low compared with many other Ohio waters, the presence of the small amount of iron does not cause trouble.

The well water is also of good quality but it shows some evidences of past pollution in the somewhat high nitrates and chlorine. (For analyses see Laboratory Report on Water Supplies.)

The ordinary death rate from typhoid fever is low, as shown in an accompanying table, and there has been but one case of typhoid since the installation of water-works.

The popular opinion of the quality of the water is very high.

TABLE SHOWING TYPHOID FEVER DEATH RATE.

Year.	Population.	Total Deaths.	Total Deaths per 100,000 Population.	Deaths from Typhoid.	Deaths from Typhoid per 100,000 Population.	Cases of Typhoid.
1898 .....	1172	20	1705	0	0	....
1899 .....	1172	no returns	.....	no returns	.....	....
1900 .....	1172	6	512	0	0	....
1901 .....	1172	26	2220	1	85	....
1902 .....	1170	6	512	0	0	....
1903 .....	1170	11	940	0	0	....
1904 .....	1170	12	1025	1	85	....
1905 .....	1170	13	1110	0	0	....
Average .....			1146		24	



## CONSUMPTION.

It is estimated that 300 persons make use of the public supply, and these use it for all purposes. In the neighborhood of 800 persons are accessible to the public supply.

Shortage has occurred in the summer months when the flow of the springs runs low, but this has been relieved by the introduction of the well water into the supply.

No estimate could be obtained of the amount of water consumed daily as no measurements have ever been made. Meter records were not available owing to a recent change in the ownership of the company.

## ACTIONS OF THE STATE BOARD OF HEALTH.

At a meeting of the Board held June 27, 1902, it was voted to approve the springs as a source of public water supply, and notice of this action was sent to A. E. Townsend, general manager of the old company.

No application for permission to use the well as an auxiliary supply was made to the Board, and no knowledge of its use as such was gained until the examination forming the basis of the present report.

The new wells are also being dug without consulting the Board but this action as well as the use of the above mentioned well was thus undertaken because of ignorance of the law on the part of the new owners.

March 14, 1906, the superintendent of water-works at Canal Fulton was notified that an investigation made by the assistant engineer revealed that, without the approval of the State Board of Health, an auxiliary supply had been introduced from a well at a farm house to increase their water supply; that analysis of samples of the water from this well showed evidence of its having received sewage contamination at some time, and that it was quite probable the privy reported within 40 feet of the well was accountable for the contamination shown.

He was advised that the Board had voted to disapprove the farm well as an auxiliary source of supply unless the above mentioned privy be removed at once to a point at least 100 feet from the well and on land sloping away from it and, that no other sewage or domestic wastes be deposited within 100 feet of this well.

Also; That an investigation would be made in the future and if it should be found that the water from this well was still in danger of contamination, further changes would be required, or the use of the well would be permanently disapproved.

He was advised further that the Board had voted to approve the plan to obtain a ground water supply from wells in an area immediately below the present water-works storage reservoir, provided:

1st. That the water from said wells, after thorough pumping, prove satisfactory to the Board; and,

2nd. That the water company purchase or obtain sole control of sufficient land surrounding these wells so that no source of pollution which, in the opinion of the State Board of Health, might affect the quality of the water, be allowed within 200 feet of any well.

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## SUPPLEMENTARY REPORT ON PROPOSED WATER FILTRATION PLANT FOR CINCINNATI.

REPORT ON PLANS FOR HEAD HOUSE, CHEMICAL HOUSE, FILTER HOUSE, VALVE HOUSES, WASH WATER RESERVOIR AND OTHER MISCELLANEOUS WORK.

On April 27, 1906, there were received from Mr. G. H. Benzenberg, acting chief engineer, board of trustees "Commissioners of water works," Cincinnati, a set of sixty plans and specifications. These plans related to the construction of a head house, chemical house, filter house, valve houses and a wash water reservoir and other miscellaneous work in connection with the municipal filtration plant under construction at Cincinnati.

The chief engineer of the Board reported upon these as follows:

*Former Actions of State Board of Health.* On January 24, 1898, the State Board of Health considered an application from the board of trustees, "Commissioners of water works," for approval of a new water supply for the city of Cincinnati, as shown on plans and specifications submitted. These plans, which showed principally a new intake near the village of California, together with new pumping station and tunnel leading to the city, were approved, subject to the condition that "the water from the new intake be filtered in a manner satisfactory to the State Board of Health."

On September 5, 1905, plans and specifications described on pages 72 to 81 of 1905 Annual Report, showing certain portions of the proposed filtration plant, i. e., coagulation basin, clear water reservoir and general features of mechanical filters, were approved by the State Board of Health, September 20, 1905, subject to the following conditions:

"1st. That the operation and care of the completed plant be subject to the approval of the State Board of Health at all times; and that any change in the method of operation or in the use of the coagulant be made when requested by the Board.

2nd. That plans and specifications describing the chemical tanks and apparatus for introducing the coagulant, the controllers and other special devices, and also the character of the filter sand and gravel be submitted to the Board for its approval as soon as completed, and

3rd. That a description of the proposed methods of operation

relating especially to the kind and amount of coagulation to be used, be submitted to the Board as soon as decided upon."

On September 22, 1905, in accordance with the condition No. 2 quoted above, specifications describing proposed filter sand, etc., were submitted and approved by the State Board of Health.

*Plans Now Under Consideration.* The plans and specifications now submitted relate to the construction of a head house, chemical house, filter house, valve houses, wash water reservoir and other miscellaneous work connected with the filtration plant. The structures and apparatus therein described are in the nature of detail work. The feature which should be most carefully considered by the State Board of Health is the chemical house. The apparatus located in this house provides for the use of lime and iron as coagulants and it is expected that these chemicals will be used, at least when the plant is first started. In case this kind of coagulant should prove unsatisfactory and its use should be stopped by the State Board of Health (under condition 1, in letter of approval of September 20, 1905) it would be possible to use the iron tank for alum.

The general construction of the head house, filter house, valve houses has been studied and is satisfactory.

It is understood that there is still another set of plans and specifications now being made, which will provide for machinery, rate controllers and other apparatus necessary to entirely complete the plant. This set of plans should be submitted to the Board for approval when made.

These plans and specifications were approved by the Board June 4, 1906, provided that the condition of approval, as set forth in the Board's letter of September 20, 1905 (quoted above), be still in force and be made a part of the approval of the plans submitted April 27, 1906.

The approval was given with the understanding that proper provision be made in the chemical house for substituting alum for lime and iron in case this is found to be desirable later; and also that the plans for controllers, lime mixing devices and any other apparatus which may in any way effect the operation of the plant, be submitted to the Board for approval when decided upon.

#### REPORT ON OPERATING MACHINERY, COAGULATING DEVICES AND COAGULANT APPARATUS.

October 22, 1906, Mr. Benzenberg, acting chief engineer, in accordance with condition second, of the approval given September 20, 1905, quoted above, submitted plans and specifications for operating machinery and apparatus for the Cincinnati water filtration plant. These plans were submitted in order to fully comply with the condition of approval quoted above. The plans consisted of 24 blue prints, showing complete details relating to the construction of the rate controlling apparatus, the pressure controllers, sampling apparatus, stirring machinery for coagulant tanks,

controllers and stirring machinery for lime saturators, and miscellaneous recording and operating devices. The rate controller was specially designed by the engineering department of the "Commissioners of water works," and before the design was adopted several controllers were made and given a thorough test at the Eden Park pumping station. The controllers were found to be entirely successful.

November 17, 1906, the Board approved these plans; and the authorities were notified that it was understood that the first and third conditions of approval of the general plans still remained in force and were a part of the approval of the plans approved on the 17th of November.

#### PROPOSED METHODS OF OPERATION.

In order to comply with the third condition of approval of the original plans a communication from the acting chief engineer of the board of trustees, setting forth the proposed amount and kind of coagulant to be used was received November 21, 1906.

The communication stated that it was proposed to use sulphate of iron and caustic lime applied as solutions, the strength of each to be applied to suit the quality of the water. The application of the chemicals was to be made by use of apparatus already approved.

The estimated amount of chemicals required for treating settled Ohio River water containing different amounts of suspended matter was given as follows:

Turbidity. Parts per million.	Sulphate of Iron. Grains per gallon.	Caustic Lime.
10	1.00	0.75
25	1.25	0.90
50	1.40	1.00
75	1.50	1.10
100	1.60	1.20
125	1.75	1.30
150	1.90	1.40
175	2.10	1.50
200	2.25	1.70
300	2.50	1.90
400	3.00	2.00

January 8, 1907, the acting chief engineer was notified that the data contained in his letter, together with information obtained from the plans submitted from personal inspection by engineers of the State Board of Health, were such that the Board considered that the third condition of approval given September 20, 1905, had been complied with.

In regard to the use of lime and iron as coagulants, it was stated that the Board had never definitely and unqualifiedly approved these chemicals, but had given temporary approval in several instances in order that cities and villages might determine by actual use whether these chemicals were most economical and best suited for their special purposes.



REPORT ON A PROPOSED WATER SUPPLY FOR THE  
VILLAGE OF CROOKSVILLE.

The village of Crooksville, Perry County, was considering the installation of a water supply and had two projects in view, namely, a well water supply to be installed and operated by the village and a surface supply to be installed and operated by the Southeastern Ohio Railway, Light and Power Company of Wheeling, W. Va.

An examination by the State Board of Health was requested and a report on the relative feasibility of the two projects. Accordingly, on March 27, 1906, the assistant engineer visited Crooksville, examined sites for the location of the proposed wells. He also went to Zanesville and called on the president of the Southeastern Ohio Railway, Light and Power Company and obtained from him an outline of the project offered by the company to the village. The following day he visited Powells Mill and collected samples from Jonathan Creek at the point where the proposed supply was to be taken.

The following report was made:

The village of Crooksville is in the eastern part of Perry County, about 14 miles south-southwest of Zanesville. The village within the corporation limits has an area of about three-quarters of a square mile, but a large part of the population extends outside these limits. The population within the limits is estimated at from 1,800 to 2,000 and the total population of the entire settlement is estimated at 3,500. Much of this growth has taken place in the last few years due to the expansion of the stoneware industry. Within a few years these outlying portions will probably be incorporated with the village.

The village lies on both sides of a small creek tributary to Jonathan Creek known as South Fork. The valley at this point is rather narrow and hills rise to a height of several hundred feet on either side. The soil is generally clayey but there are outcrops of limestone in the neighborhood and deposits of gravel of poor quality.

The principal industry, as suggested above, is the manufacture of stoneware, the articles manufactured being jugs and preserving jars. There are nine potteries of considerable size and they are said to produce an exceptionally good product. Coal mining is carried on to some extent and it is estimated that there are three hundred mine employes in and near the village.

Due to its rapid growth in recent years, Crooksville is in great need of public improvements and the village authorities seem desirous of introducing these as soon as possible; particularly a water supply for fire protection, since but a few days previous to the time of this examination a fire caused the destruction of one of the potteries with an estimated loss of \$40,000, and it was only the favorable direction of the wind that prevented



a large portion of the village from burning. The village also contemplates a sewerage system to be built at the same time the water-works are installed.

At the present time water is obtained from roofs, shallow wells and deep wells. The well water is generally hard though it is claimed there are some exceptions. Potteries in the village have found difficulty in obtaining an adequate supply from wells. It is now proposed to introduce a public supply to be obtained in one of two ways. The first is a municipally owned and operated supply to be derived from driven wells, the other a filtered surface supply to be obtained from Jonathan Creek at Powells Mill and owned and operated by the Southeastern Ohio R. L. and P. Company of Wheeling, W. Va.

*Well Supply.* The sites contemplated by the authorities for the wells are in several small ravines a short distance east of the village. As very high hills lie between these ravines and the village, they are not likely to be built up for some time to come. No test wells have been driven and there is no means of knowing whether a sufficient supply of proper quality can be obtained from the wells in this location. Ample land for the protection of the water supply is available for purchase.

*Jonathan Creek Supply.* The Southeastern Ohio R. L. & P. Company had the matter of a supply for Crooksville and Roseville, to be derived from Jonathan Creek, before the State Board of Health during January of the present year and were notified, January 26, 1906, that the supply as contemplated could not be furnished without filtration. The watershed of Jonathan Creek above Powells Mill has an area of 124 square miles and a total population of about 7,000, about 4,000 of which is concentrated in 17 villages. Twelve of these villages are located directly on the stream or its tributaries, and represent a total population of about 1,300. None of these have sewers or water-works so that sewage pollution is probably slight.

The topography of the watershed is generally hilly and the run off is rapid.

The flow of Jonathan Creek at Powells Mill does not fall much below 2,000,000 gallons per day in extreme dry weather and may reach as high as 150,000,000 gallons per day in times of flood, according to recent measurements of the United States Geological Survey.

It is the purpose of the company to construct a low dam across the creek to impound sufficient water to tide over extremely dry periods.

The quantity of water required for some years to come can scarcely exceed 1,000,000 gallons per day, even should the village of Roseville be supplied from the same source. The company estimates about 5,000 people in all for two or three years to come.

The design of filters to be used has not as yet been decided upon but they will be of mechanical type and probably furnished by one of the filter companies.

The pumping machinery is to be located in the present power station at Powells Mill. The pipe line for conveying water to Crooksville will be of cast iron, probably 12 inches in diameter and about 9 miles long.

The authorities at Crooksville have not as yet obtained engineering advice regarding the relative feasibility of the two projects contemplated, so that it is not possible to state the estimated population to be supplied, the amount of water required, the relative cost of the two supplies, and numerous other conditions on which a final decision as to the relative merits of the two projects would depend.

At the same time the water supply is installed it is proposed to introduce a sanitary sewerage system. (See separate report by assistant engineer on a Proposed Sewerage System for Crooksville, April 2, 1906.)

At a meeting held January 17, 1906, the Board decided that it would be necessary to require that the water from Jonathan's Creek be filtered if used as a supply for the village.

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## REPORT OF THE PROPOSED WATER SUPPLY FOR GARRETTSVILLE.

The board of trustees of public affairs of Garrettsville requested an examination of the proposed water supply, and July 9th, 1906, Mr. L. E. Chapin, consulting engineer, submitted plans for the proposed scheme. July 12th, the assistant engineer visited Garrettsville, made an inspection of the conditions involved, and collected a sample of water from the proposed source after a thorough pumping test. The following report was made:

The village of Garrettsville is located in the northeastern portion of Portage County, near the divide between the Mahoning River and the Grand River watershed. The surrounding country is undulating to hilly, the highest points rising perhaps to two hundred feet above the stream bottom. Throughout a large part of the country to the northeast of Garrettsville, the geological formation consists of a layer of yellow clay just below the surface this being underlaid by a stratum of white sandstone, anywhere from twenty to fifty feet in thickness, and this in turn underlaid by very hard blue clay, extending to a great depth. The principal industries in the neighborhood of Garrettsville, are farming and cultivation of the sugar maples. The village of Garrettsville at the present has a population of about 1,300, there are as yet no paved streets, no public sewers nor public water supply. The public authorities make every effort to have the village attractive, and as a result the streets are in good state of repair, and the village in general presents a clean and thrifty appearance.

It is desired at the present time to provide the village with a public

water supply both for fire protection, and to be used for domestic purposes. Accordingly the village secured the services of Mr. L. E. Chapin, C. E., consulting engineer of Canton, Ohio, and made a search for suitable wells.

Several localities have been considered, but the most successful as regards yield and appearance of the water were found at the confluence of two small creek valleys on the farm of Colton and Newcomb. This locality is very sparsely settled and there are no buildings or source of pollution within 2,000 feet or more.

Up to the present time eight wells have been drilled as shown on the accompanying blue print, several more wells are contemplated and in a general way the wells are located in such a manner as to intercept the underground flow of water. All of the wells so far drilled pierced the same geological formations.

Near the surface was found a layer of yellow clay, under this a layer of white sandstone rock which varied in thickness from 40 feet to 60 feet. Samples of this rock obtained from the wells indicate it to be of almost pure silicious material. The upper portion is exceedingly fine grain and the rock becomes coarser and coarser with increased depth. The lower eight feet or so, of the sandstone stratum are more properly a conglomerate or coarse gravel, as it contains white quartz pebbles, varying from the size of a pea to the size of a hen's egg. This conglomerate forms the water bearing stratum from which all the wells derive their supply. The sandstone above described is soft and friable, and the well drill pierced it at the rate of 40 feet per day in a 10-inch hole. The upper surface of the sandstone seems to be somewhat irregular, and in a general way the sandstone stratum is thicker in the up-hill region than towards the valley. The lower surface of the conglomerate seems to be almost a perfect plane and has an inclination of about one foot in fifty towards the southeast, underlying the conglomerate is an impervious layer of a very hard blue clay locally called a shale. None of the wells drilled went below this layer of clay, which is believed to be of considerable thickness.

It was found that a better yield could be obtained from the wells by shooting them after the conglomerate had been reached. This being done the water level in the well rose to a height of about 55 or 60 feet above the bottom of the conglomerate.

*Description of Wells.* The wells are all driven just to the clay and vary in depth from 41 to 73 feet, they are all protected from surface washing by means of wrought pipe casings 10 inches in diameter, for all wells except No. 8, which has a casing 6 inches in diameter. The following table gives logs of the various wells:

## ELEVATION AT WELLS ALL 10 INCHES DIAMETER.

No.	Top.	Rock.	Bottom.	Water Level	Depth.
3.....	1048.6	1042.6	975*6	1034.6	73 ft.
1.....	1038.1	1033.4	974.1	1029.1	64 "
4.....	1038.3	.....	974.3	1029.3	64 "
2.....	1034.3	1029.3	973.3	1013.3	61 "
5.....	1021.1	1013.6	973.1	.....	48 "
6.....	1014.0	.....	970.0	1004.7	44 "
7.....	1013.8	.....	972.8	.....	41 "
8.....	1010.0	.....	969.0	.....	41 "

*Pumping Test.* The following is a description of the several pumping tests which have been carried out on the wells.

Wells Nos. 1, 2, 3, and 4, were pumped together continuously for 72 hours, at the rate of 3,600 gallons per hour, 86,400 gallons per day. The extreme suction being 27 feet, during this test the water in the wells was lowered from 7 to 19 feet. When pumping was stopped the wells recovered their original level in less than ten minutes, none of the other wells were affected at all by this test.

Wells Nos. 2 and 3 were pumped continuously for 36 hours at the rate of 1800 gallons per hour. The water level was lowered in each about 19 feet. Wells Nos. 1 and 4 were not affected at all. Wells Nos. 1 and 4 are within 10 feet of each other, No 2 is about 100 feet to the southwest, No. 3 is about 100 feet to the northwest, so that wells Nos. 1 and 4 act as a single well, equi-distant between wells Nos. 2 and 3, all being at right angles to the supposed direction of the ground water flow.

Wells Nos. 1 and 4 were pumped for 36 hours at the rate of 1,800 gallons per hour and did not affect wells Nos. 2 and 3. The wells Nos. 1 and 4 are but 10 feet apart, and were shot together so that they act as a single well, the water level in each rising and falling the same, even when the suction pipe is placed in but one of the wells. Wells Nos. 5 and 7 were tested just previous and up to the time of this examination, they were accordingly selected as the wells from which samples were taken. Nos. 5 and 7 were started at 6:00 P. M., July 11th, and were pumped at the rate of 3,000 gallons per hour, until 9:00 o'clock, July 12th, at this time well No. 8 was thrown in and all were pumped at the rate of about 4,000 gallons per hour. No. 8 had just been drilled and shot, consequently, the water ran high and turbid. The three wells were pumped to-

gether until 3:00 o'clock the same day, but as only a small amount of clarification had taken place, No. 8 well was thrown out and the samples were then collected from wells Nos. 5 and 7 only. After pumping ceased wells recovered their original level within a few minutes.

Wells Nos. 5 and 7 were also comparatively recently drilled and shot so that they did not run perfectly clear. From experience with the other wells however, there is scarcely any doubt that they would have cleared up with a few hours more pumping. During the test on wells Nos. 5, 7 and 8; wells 1, 2, 3, and 4 were not affected, and the water level in No. 6 was lowered but slightly.

*Quality of Water.* The report of the chemist and bacteriologist of the Board indicates this water to be of very good quality from a sanitary point of view though the iron present may be found objectionable. (For analyses, see Laboratory Report on Water Supplies.)

August 1st, 1906, the Board approved the proposed water supply for Garrettsville, to be derived from wells located at the confluence of two small valleys on the farm of Colton and Newcomb, as shown on plans prepared by L. E. Chapin, consulting engineer, and presented July 9th, 1906, providing that, for future protection of the wells against pollution, the village purchase, or pass regulations controlling, all the land surrounding the wells so that no sources of pollution can be located within 500 feet of any well.

The Board also suggested the advisability of making some provision for the removal of the iron from the water, unless after prolonged pumping it should be found that the iron has been very much decreased.

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## REPORT OF PROPOSED WATER SUPPLY FOR IRONTON.

On November 6th, 1905, the assistant engineer visited Ironton and made an examination of the well proposed as a source of public water supply. The following report was submitted:

The city of Ironton has a population of about 15,000 and is located on the north bank of the Ohio River, and a stretch of level ground or shelf in the river valley formed principally of river deposit. The general elevation of the built-up portion of the city is about fifty feet above mean low water.

Since 1872 the public water supply has been drawn directly from the Ohio River. It has never given satisfaction, principally on account of the high turbidities. It is also seriously sewage polluted, which is no doubt responsible for the high typhoid fever death rate in the city, as shown in the following table:



TABLE OF VITAL STATISTICS WITH SPECIAL REFERENCE TO THE TYPHOID  
FEVER DEATH RATE.

Year.	Population.	Total Deaths.	Total Deaths per 100,000 population.	Deaths from Typhoid.	Deaths from Typhoid per 100,000 population.
1890 .....	10,939	169*	1930†	7*	82.3‡
1891 .....	11,032	171	1550	5	45.3
1892 .....	11,125	136†	1465‡	4†	44.5‡
1893 .....	11,218	205	1830	6	53.5
1894 .....	11,311	162	1430	9	79.5
1895 .....	11,404	200	1752	7	61.3
1896 .....	11,497	205	1785	11	95.8
1897 .....	11,590	180	1555	12	103.5
1898 .....	11,683	184	1575	11	94.3
1899 .....	11,776	198	1680	11	93.6
1900 .....	11,868	180	1520	10	84.4
1901 .....	11,961	238	1990	7	58.5
1902 .....	12,054	228	1690	7	58.0
1903 .....	12,147	143	1180	8	65.9
1904 .....	12,240	162	1320	4	32.7
1905 .....	12,333	205	1660	6	48.6
Average .....			1630		69.0

\* Deaths for nine months.

† Deaths for ten months.

‡ Rate per hundred thousand per year estimated.

During recent years there has been considerable agitation for a new and better public supply. It was thought advisable for reasons of economy to follow the precedent of Gallipolis and obtain a supply from the river gravel by means of shallow wells sunk therein. Accordingly, test wells were located on both the Ohio and Kentucky shores above the city. Those wells on the Ohio shore yielded a water of very poor quality, not so much from the sanitary point of view as on account of the high mineral content. The iron in particular was so great as to render it seriously objectionable for domestic use.

The wells on the Kentucky side proved more of a success. Recently a large wooden crib, 10 feet in diameter, was sunk at a point on the Kentucky side and about one mile above the present pumping station, for the purpose of ascertaining on a practical scale the quantity and quality of the water that can be obtained in this way. The crib is constructed of wood consisting essentially of two hollow water-tight cylinders, one placed inside the other and held together and braced in the annular space between them. The inner cylinder has a 10-foot inside diameter and the outer cylinder approximately an 11-foot diameter. The bottom of the

cylinder is provided with a metal shoe for piercing more readily the sand and gravel through which it is sunk. The crib was placed in about six feet of water and sunk to a depth of eight feet into the sand and gravel bed of the river by dredging from the inside. In this position the bottom was under a head of something over fourteen feet of water and is about five feet above the solid rock.

The conditions above described obtain at medium low water. A pump has been installed on top of the the crib and the well was pumped at the rate of 500,000 gallons per day for thirteen days previous to the examination. Pumping at this rate lowered the water in the crib to within two or three feet of the bottom, thus giving an effective filter head of about eleven feet. The pump was shut off for a short time while measurements of the rise of water in the crib were made. It appeared that the rise was very nearly one-half foot per minute or 450,000 gallons per day. The water was very clear in appearance and practically free from turbidity. As nearly as could be ascertained by observation, the filtration was practically uniform through all parts of the bottom, though here and there around the circumference there were small spouts most likely due to leaks in side of crib.

Chemical and bacterial samples were taken of the water in the crib and from the river near the crib at time of examination. One week later additional samples were taken in the same places. (The results of these analyses are given in the Laboratory Report on Public Water Supplies.) It will be observed that the bacterial efficiency is in the first set about 94.7 per cent., and in the second set 95.7 per cent., which is somewhat inferior to the efficiency obtained by a filtration plant. A few samples, however, are not sufficient to indicate with certainty the average results that can be regularly obtained owing to the uncertain and uncontrollable nature of the filtration that takes place. It may be noted that at times, some years ago, the wells at Gallipolis gave no better efficiency than now obtained at Ironton, but recently the number of bacteria in the filtered water has been exceedingly low. On the other hand at several places water obtained in a similar manner has deteriorated. The chemical analyses indicate the water from the crib to be purified river water, though admixed with a small portion of ground water which increases the mineral content somewhat. The most serious effect of this admixture is the increase in incrustants from eighteen parts per million to thirty-two parts per million, thus causing the water to be somewhat less desirable for use in boilers.

It is claimed that the bar on which the well is located has changed practically none during a long series of years and this would favor the success of the proposed supply. It should be observed, however, that the bar is in a rather exposed condition and should the river change so as to scour in this general locality the efficiency of the purification process might be seriously impaired.

Samples of material composing the bar were taken at foot intervals to a depth of eight feet. Analyses of these indicate that at depths ranging from one to five feet below the surface of the gravel the effective size ranged from .28 to .35 millimeter or about what is generally considered suitable for sand used in slow sand filtration. The uniformity coefficient on the other hand ranges from 2.1 to 7.8 which is very high. Below five feet and above one foot depth the material is considerably coarser and contains much large gravel. Such material would probably not give a good efficiency unless the area is amply large to make the rate of filtration low. Should the project be approved it would be highly advisable to provide enough wells so that the rate of filtration shall at least be as low as that at present obtained, namely, four gallons per square foot of inside area of well per minute, and the wells should be placed sufficiently far apart not to influence each other. The proper distance between wells may be approximately figured by assuming that filtration through the gravel will take place at the rate of 2,000,000 gallons per acre per day, probably a safe figure, and so placing the wells that they will be surrounded by a circular area of one acre for every 2,000,000 gallons capacity of the wells, this area not to be influenced by the area surrounding a neighboring well. Thus in the case of the present test well having a safe capacity of about 450,000 gallons per day there would be required an area of 450,000 divided by 2,000,000 or .225 acres. This would mean a circle having a diameter of 112 feet, hence another well of equal capacity should be placed 112 feet distant. It should be realized that this problem is fraught with uncertainties and that the above figures are only approximate though probably on the safe side.

#### CONCLUSIONS.

It would appear that the water at present obtained from the crib, and which might be expected to be obtained from wells sunk to the same depth, is of good quality from a sanitary point of view and is also a suitable water for industrial purposes. Owing to the lack of past experience with water supplies obtained in this manner, it is very difficult to predict whether it will remain of good quality. One case, notably that of Gallipolis, has proved an unqualified success; whereas, in other cases, for example East Liverpool and Mingo Junction, this method of securing a public water supply has been unsuccessful. It would not, therefore, be safe to give an unconditional approval of such a supply. Should the supply be adopted, analyses, both chemical and bacterial, should be made at frequent intervals. In the event the water is found to be deteriorating to a dangerous degree, a filter plant should be installed. The sum expended on the proposed installation will not be wasted, since the water obtained from the wells can be more readily treated by mechanical filtration than the raw river water in that a smaller

capacity would be permissible in the settling basins and a smaller quantity of coagulant would be necessary.

The Board on November 21st, 1906, approved the proposed scheme for obtaining a public water supply for the city of Ironton from wells sunk in the Ohio River at a point near the Kentucky shore and about one mile up stream from the present pumping station, provided :

1st. That complete plans showing detail arrangements of the proposed supply be submitted to the State Board of Health for approval as soon as these plans are made.

2nd. That a filtration plant, of a design satisfactory to the State Board of Health be installed whenever this is deemed necessary by said Board.

3rd. That the distance between wells shall be figured in the following manner: The average rate of filtration through the gravel shall be figured at the rate of 2,000,000 gallons per acre per day, and sufficient area shall be provided about each well so that this rate shall be maintained. The cross-sectional area within the wells shall be such that the draft from any well shall not exceed 4 gallons per square foot per minute.

4th. That a sufficient number of wells be used so that the combined interior cross-sectional area of all the wells shall equal at least 250 square feet; and,

5th. That samples of water drawn from the wells be submitted for chemical and bacteriological analyses at intervals not greater than three months.

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## REPORT ON PROPOSED WATER SUPPLY FOR LEESBURG.

In response to an application from Mr. G. L. McKibben, then consulting engineer for the village of Leesburg, the chief engineer visited that place on June 12, 1905, and inspected several sites proposed for water-works. Before definite plans were made, however, the services of Mr. McKibben were dispensed with and the work was carried on by the the board of trustees of public affairs without the service of a consulting engineer.

The following report was made:

Leesburg is a village of about 800 population, located in the northern part of Highland County. At present there is no public water supply, and, as the town has been visited by a severe conflagration, public sentiment has been aroused to such an extent as to demand the installation of this supply as soon as possible. It is expected that the supply, as soon as installed, will be used to a greater or less extent for domestic purposes, as well as for fire protection. It is expected that about 200 people will use the supply as soon as installed, and that the mains will be extended over the more thickly settled portions of the corporation.



At the time of inspection, the site which appeared to be most favorable for furnishing a pure supply of water was a spring known as the Beeson spring, located south of the B. and O. R. R. and about one mile west of town. A sample of water from this spring was analyzed in the State Board of Health laboratory and found to be excellent. The water from the Beeson spring could have been conveyed through a vitrified pipe conduit to a pumping station to be located in the center of the village. It has been found, however, by weir measurement that the flow of this spring was only about 30,000 gallons per day and the project was, therefore, abandoned.

Among other possible sites inspected at the time was an area known as the Mikoff property in the southeasterly part of the corporation. This site has been chosen for the proposed water-works, and a lot containing  $1\frac{1}{2}$  acres has been purchased by the village. This lot is bounded on the south by B. and O. R. R., which is also the corporation line, and on the west by a depression or gulley, which serves to keep surface drainage, coming from the west, away from the water-works property. The nearest houses to the lot are about 500 feet distant in the westerly direction and the drainage from them is cut off, as just mentioned, by the ditch. There is no house in any other direction for perhaps 1,000 feet. The site is, therefore, judging from surface conditions, very suitable for public water supply purposes.

One test well has been driven. This consists of a 6-inch pipe extending from the top through 5 feet of soil into the rock. From there down the well is drilled through rock to a depth of 154 feet. The rock is principally limestone of various grades. The water rises to within about 40 feet of the surface. Pumping tests have shown the well to yield 40,000 gallons per day without diminishing its capacity. One or two more wells will, therefore, probably furnish an ample supply for the village for some time to come.

A sample of water from this well was collected by the health officer and sent to the laboratory for examination. Results show the water to be suitable for public supply, although it contains a little more iron than is desirable and is rather hard. Pumping by air-lift into standpipe, as is proposed, will doubtless decrease the quantity of iron.

At a meeting held April 18, 1906 the Board approved this proposed source of water supply for Leesburg to be derived from wells located upon the so-called "Mikoff Lot," located in the southeasterly portion of the corporation, adjacent to the Baltimore and Ohio Railroad, provided, that no source of pollution, which, in the opinion of the State Board of Health, would affect the public water supply, be allowed within 500 feet of any of the proposed wells.



## REPORT ON A PROPOSED ADDITIONAL WATER SUPPLY FOR LEETONIA.

The assistant engineer visited Leetonia on December 16, 1905, made an examination of the proposed additional water supply for that village, and submitted the following report:

Leetonia has a population of about 3,000 people. The water-works was installed in 1889 and the average daily consumption is about 172,000 gallons. The present supply is derived from 18 springs or shallow wells, which collect the water as it emerges from a gravel outcrop on the side of a hill immediately east of the village. The water flows by gravity from these wells to the pumping station, some 1,500 feet distant in a westerly direction.

This supply has been examined and found satisfactory to the State Board of Health. In times of dry weather, however, the quantity of water becomes insufficient and accordingly it is proposed by the village authorities to draw an additional supply from two driven wells and a small surface stream which is tributary to Cherry Fork, seven-eighths of a mile south of the village.

*Proposed Wells.* The proposed wells are located close to the stream above mentioned and 5,000 feet southeast of the pumping station.

Well No. 1 is 8 inches in diameter, and is driven to a depth of 256 feet, through 4 feet of clay and 252 feet of shale and rock; the latter being mostly limestone.

Well No. 2 is 8 inches in diameter, 202 feet deep and is driven through 6 feet of clay and 196 feet of shale and rock.

Water is pumped from both wells by means of compressed air and conveyed to the pumping station through a 6-inch cast iron pipe. The yield of the wells has not been accurately tested although they have been pumped continuously for several weeks without showing signs of a diminishing supply. It was observed by the superintendent of the water works that the flow of well No. 2 was carried away in a 4-foot length of 3-inch pipe under a head of 9.5 inches. This would indicate an approximate discharge of 142,000 gallons in 24 hours. As the shortage of the present supply from the springs, probably does not exceed 75,000 gallons per 24 hours, it would appear that this additional supply would be ample.

The geological formation together with the considerable depth of the wells, and the fact that no houses are located within 600 feet, would indicate freedom from sewage pollution.

Samples of water from these wells were collected by the health officer on November 14th. Analyses of these samples showed that while well No. 2 was quite satisfactory, well No. 1 was displeasing in appear-

ance and contained organic and suspended matter which rendered it unfit for a public supply.

An analysis of a sample collected at the time of inspection, however, from well No. 1 showed a very decided improvement in the water from this well since the time it was first sampled. The second analysis indicated that this water was very similar to that of well No. 2 and that it can be used with safety and satisfaction. The objectionable matters in this first sample from well No. 1 are thought to be due to deposits in the pipe. (For analyses see Laboratory Report on Water Supplies.)

*Proposed Supply from Tributary of Cherry Fork.* This small stream originates from several springs in Unionville, two miles above the point of the stream from which it is proposed to take the water.

Just below its source the stream flows directly through a barnyard, close to a hogpen and within 50 feet of a privy. Below this point the only pollution is from cattle and material which might reach the stream from privy vaults several hundred feet distant. The water when inspected was very clear but is said to become decidedly turbid in times of rain. At the time of inspection the flow of the stream appeared to be about 200,000 gallons per day.

The proposed intake is a small wooden crib through which a 6-inch pipe extends and is connected with the conduit pipe leading from the wells above described to the pumping station. Valves are provided at the wells and also at the pumping station by means of which water from wells or stream may be used or may be wasted back into the stream if desired.

Although the use of this stream in connection with the public water supply has never been approved by the State Board of Health, it has been used from time to time for six months.

The analysis of a sample collected from this stream near the intake, at the time of inspection, showed evidence of contamination. The opportunities for pollution of this stream, however, as shown by inspection, would make it dangerous as a source of water supply.

January 9, 1906, the Board approved the source of supply to be derived from two driven wells known as No. 1 and No. 2, located near the present water-works pumping station, provided that no source of pollution which, in the opinion of the State Board of Health, might influence the quality of the water, be allowed within 500 feet of these wells; disapproved the use of the water from the small tributary of Cherry Fork as a source of public water supply, and ordered that the use of this stream be discontinued at once and all connections by means of which the water could be used in the village supply be destroyed.

## REPORT ON PROPOSED WATER SUPPLY FOR MEDINA.

On July 31st, Mr. E. G. Bradbury, consulting engineer, submitted plans for a proposed water supply for the village of Medina. In anticipation of these plans being submitted the chief engineer made an inspection of the proposed site on June 7, 1906; and on July 13, the assistant engineer directed a pumping test of the proposed source of water supply, and collected samples of water for analysis. The following report was made:

*Present Conditions.* Medina is a village of about 2,500 inhabitants, and is the county seat of Medina County. It is located upon the upper portion of the watershed of the Rocky River and very near the divide which separates the Great Lakes from the Ohio River drainage. The first public water supply was installed in 1886. This supply gradually failed and was abandoned.

In 1898 the present supply, derived from two wells, about 100 feet deep in a shale formation in the valley of Champion Creek near the center of the village, was installed. This supply was approved by the State Board of Health with strict conditions relating to the care of privy vaults. Analyses at that time showed the water to be safe from an organic standpoint, although undesirable on account of its mineral content. The supply has proved very unsatisfactory both on account of its taste and odor, due to the mineral characteristics, and also because the quantity is decidedly limited.

The distribution system at present consists of 2.3 miles of pipe and there are about 100 taps. The present supply is now used by 400 people and by two manufacturing concerns. The average daily consumption is about 20,000 gallons, a large portion of which is used by the above factories. When the proposed supply is installed the present supply will be abandoned.

It is estimated that with a suitable supply there will be at least 1,000 consumers, and that the total consumption would be in the neighborhood of 100,000 gallons.

*Search for New Supply.* For the purpose of obtaining a new and satisfactory water supply within a reasonable distance of the village, thorough investigation has been made by the consulting engineer.

The small valley lying south of Lafayette road has been considered as a possible site for reservoirs and the collection of surface and spring water; but the estimated amount of water available was not large enough to warrant consideration of this project.

Near the county infirmary,  $3\frac{1}{2}$  miles southwest of the village the ground is of a "springy" nature, and wells driven here have shown artesian conditions; but considering the uncertainty and also expense of this project, search was made elsewhere.

The water bearing rock along the valley of Champion Creek was tested, two wells being driven, one in the property of Mr. Reuben Fenn, and the second on land near the fair ground. The first well, 120 feet deep, gave salt water. The second yielded water very similar to that of the present public supply, and was unsatisfactory. The recent investigation as well as past study of the subject have demonstrated that it is impossible to obtain satisfactory water from the shale rock in this locality.

*Proposed Plans.* After making these investigations it was decided that the most feasible project was to take water from the north branch of the Rocky River, at a point about three miles northeast of the center of the village.

The watershed of this stream above the proposed works contains 37 miles, upon which is an estimated population of 1,450 people or about 40 per square mile. This population is generally scattered; although at the village of Weymouth, located a little over 2 miles above the proposed water-works, there are 200 to 300 people. This village in the course of its growth will undoubtedly discharge more or less domestic drainage into the stream.

The quantity of water flowing in the river from estimates based upon rainfall figures, and also from statements of old residents, is probably sufficient to supply Medina for a long time in the future. An impounding reservoir could be built at a small cost when necessary.

Although the north branch of the Rocky River is by no means badly polluted, yet the water in an unpurified state, would not be suitable for a public supply. Some method of purification is therefore necessary.

In order to obtain a water purer than the raw river water, the proposed plans provide for laying about 1,500 feet of six and eight inch tile in a gravel deposit adjacent to the river channel immediately above the proposed pumping station. This gravel deposit is uncovered except at high stages of the river and has an average depth of about 4 feet, under which is a clay stratum. It is probable, therefore, that the water collected by the tile pipe will be river water and not ground water from the land side.

A six days pumping test made with 175 feet of this pipe yielded 90 gallons per minute. With the anticipated water consumption of 100,000 per day, therefore it is probable that 1,500 feet of pipe would yield an ample supply.

Samples of water collected during this test showed that the water yielded by the drains was of satisfactory quality. During the test, however, the river was so low that the drains were supplied by a lateral rather than by a vertical filtration. Such lateral filtration would naturally afford much greater purification. It is a question whether or not at times of high stages in the river, when the water is most polluted, an efficient filtration will be obtained, as the water will then be directly



over the drains and the rate of filtration through the four miles of coarse gravel will be very rapid, and hence not thorough.

As a means of preventing the gravel deposit from washing away it is proposed to construct a concrete dam at the lower end of the area under-drained. It is thought by the consulting engineer that this method of so-called, natural filtration will be more satisfactory than mechanical filtration. This would naturally be true if the conditions were always the same as at the time of the investigation. During time of high water, however, as above discussed, conditions may be different. By omitting the construction of the filter plant about \$2,000 will be saved.

The pumping plant will be located on the easterly bank of the river and a short distance from the highway. There will be a pump well 10 feet in diameter, and 10 feet deep into which the water from the gravel deposit will flow by gravity. The pumping station will cover an area of about 1,500 square feet, and there will be two 50 H. P. boilers, and two duplex compound pumps, with a daily capacity of 250,000 gallons.

The pumps will force the water into the present standpipe, holding 100,000 gallons, through an 8-inch cast iron force main about three miles long. The total lift will be 280 feet.

The portion of the distribution system for immediate construction will include 13,000 feet of 4, 6 and 8 inch pipe. It is believed that the proposed works would, without enlargement, provide water for some 4,000 people, and will give ample fire protection.

The estimated cost of the works is as follows :

Underdrains, dam, etc.....	\$ 1,000 00	
Pump station .....	2,950 00	
Pumps, boiler, etc .....	4,000 00	
Force main .....	12,000 00	
Distribution system .....	60,275 00	
		<hr/> \$80,225 00

August 9th, 1906, the Board approved plans for a proposed new water supply for Medina, to be derived from the north branch of Rocky River at a point about three miles northeast of the center of the city shown upon drawings submitted July 31st, 1906, provided :

1st. That filters of a design satisfactory to the State Board of Health be installed whenever this is deemed necessary by said Board; and,

2nd. That the board of trustees of public affairs at Medina adopt and enforce a set of rules and regulations, for the protection of the watershed of the north branch of the Rocky River above the proposed water works, first submitting such rules and regulations to the State Board of Health and receiving its approval.



## REPORT OF INSPECTION OF THE CONSTRUCTION OF THE NEW WATER SUPPLY AND WATER FILTRATION WORKS FOR NEWARK.

In July, 1905, plans for a new water supply, water filtration plant and distribution system for the city of Newark were submitted to the State Board of Health. This supply was to be installed to take the place of the present plant of the water company, with which the city could not agree. Three hundred thousand dollars had been provided for this purpose by popular vote. The proposed plans were drawn up by Lewis K. Davis of Pittsburg.

The plans provided:

(a) For the use of the water from the North Branch of the Licking River to be taken at a point about one-fourth mile above the present water-works;

(b) For the purification of this water by slow sand filtration with preliminary rapid filtration through broken stone and sponge clippings, together with the use of alum to obtain coagulation at times when the high turbidity of the river renders this necessary; and,

(c) For a distribution system consisting of about twenty miles of water mains into which the water is to be pumped continuously.

These plans were approved upon the following conditions:

1st. That the slow sand filters be covered with a substantial roof.

2nd. That the filtration plant be included in the construction of the first portion of the proposed work; and,

3rd. That any change in the operation of the plant be made when required by the State Board of Health.

In September, 1905, a proposed amendment to the plans, consisting of a change in the location of the intake to a point nearer the city, was approved.

On December 20, 1905, the assistant engineer inspected the progress of construction of the proposed work and submitted a report.

From this report it appeared that the city was not fulfilling the second condition of the approval, namely, "That the filtration plant be included in construction of the first portion of the proposed work." It was evident that the city was proceeding to spend all the available funds on the pumping machinery, pumping station, distribution system, etc., and that it intended to allow the construction of the filtration plant to depend upon the willingness of the people to vote for the proposed bond issue of two hundred thousand dollars, necessary to complete the entire water works system. It was said that a special election for this purpose would be held in the spring.

The chief engineer reported that if the present water supply were continued in use for domestic purposes and the new supply used for fire

protection only, until the filtration plant was completed (as the authorities claimed would be the case) then there would be no danger to the public health from the new supply. But it would probably be very difficult under practical conditions to prevent the use of this water for domestic purposes, as the new mains would extend over districts not covered by the system of the water company, and furthermore, if the authorities contemplated such a departure from the approved plans, the State Board of Health should have been notified.

This matter was considered by the Board at a meeting held January 17, 1906, and the Board was of the opinion that it would be very unwise to permit the use of unfiltered water even for so-called fire protection and the board of public service of Newark was notified, January 22, 1906, that the State Board of Health would expect compliance with its former conditions of approval of the public water supply and that the Board would disapprove and resist the admission of unfiltered water into any water mains for either fire or domestic purposes.

Later suit was brought by a citizen of Newark representing himself to be a tax payer, to enjoin construction of the water-works. An effort was made to have the State Board of Health introduced into the case on the grounds that the contracts were illegal because the conditions contained in the Board's approval of the water-works plans had not been complied with.

The case was thrown out of court, however, on its being shown that the person who brought the injunction suit was not a property owner.

Later by agreement of all parties concerned, the court of common pleas issued the following decree:

THE STATE OF OHIO, LICKING COUNTY,

IN THE COURT OF COMMON PLEAS.

The City of Newark by Frank A. Bolton, City Solicitor,  
*Plaintiff.*

vs.

The American Light and Water Company, William C.  
Christian, Milton M. Taylor, James W. McVeigh,  
Frank P. Maurath and R. C. Bigbie,

*Defendants.*

No. \_\_\_\_\_  
Journal Entry.

Now come the parties herein by their attorneys and thereupon this cause came on for hearing on the pleadings and the evidence and was submitted to the court; on consideration whereof the court finds that the allegations of the cross-petition of the state of Ohio are true and that said cross-petitioner is entitled to the relief prayed for.

It is therefore considered and decreed that the city of Newark and the defendants the American Light and Water Company, William C. Christian, Milton M. Taylor and James W. McVeigh and each of them be and they are hereby perpetually enjoined from introducing and from permitting the introduction of a new public water supply into the city of Newark and from changing or extending the

water supply now in use until the sources of such new changed or extended water supply shall have been approved by the State Board of Health. Said city of Newark may introduce water from a new or extended source of supply into the mains laid by the American Light and Water Company, provided that no connection be made between the water mains into which said new, changed or extended water supply is introduced, and any building, private or public, and provided further that said new water supply so introduced into the mains laid by the American Light and Water Company be used only for the purpose of extinguishing fires or sprinkling the streets of said city, and be accessible only for such purpose; and said parties hereinbefore named and each of them are hereby enjoined from making any connection between the water mains into which said new, changed or extended water supply is introduced and any building, private or public, and from permitting the use of said water for any purpose other than for extinguishing fire or sprinkling streets, and from introducing water from any new or extended source of supply into any water mains which are now or may hereafter be connected with any buildings or accessible for general use until said new source of supply has been approved by the State Board of Health, and until said State Board of Health has consented to the introduction of the same for general public use.

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## REPORT OF THE PROPOSED WATER SUPPLY FOR PLYMOUTH.

On February, 17, 1906, application was made for approval of an additional water supply for Plymouth. An inspection of the conditions at Plymouth was made by the chief engineer on April 24, 1906, and the following report submitted:

Plans for proposed water supply for the village were first submitted in the latter part of 1901, by Mr. J. B. Weddell, consulting engineer. These plans call for the use of Huron River as a source of supply. The Board voted to approve this supply upon the following conditions:

1st. That the water be filtered in a manner satisfactory to the State Board of Health; and,

2nd. That plans, showing proposed method of filtration, be submitted to and receive the approval of the State Board of Health.

No filtration plant has ever been installed nor have plans for the approval of such plant been submitted to the Board.

On April 16, 1902, a sample of water from a drilled well, 80 feet deep, the upper 9 feet passing through clay and the remainder through sandstone, was sent to the laboratory of the State Board of Health and analyzed at the request of the superintendent of the Plymouth water works, Mr. Beelman. Analysis of this sample showed the water to be suitable for a public supply but the project was never acted upon formally by the Board because no definite plans, showing the location of the well, were ever submitted.

The inspection on June 15, 1905, showed that the water-works had

been constructed, though never approved, and the supply was being derived from both wells and river direct. The inspection and analysis of the river water showed the river above the intake to be dangerously polluted.

The supply of which the approval of the Board is now requested is to be derived from the same river and at about the same point, and also from drilled and dug wells near the present location.

In regard to the supply from the Huron River, this project has already been acted upon by the Board and approved on the conditions quoted above. In spite of these conditions, however, the creek water has been used in an unfiltered state to a considerable extent, as far as can be learned. No definite steps toward filtration were ever taken. The watershed of the creek contains, according to the statement of the local health officer, a population of 500, and there are some 25 cess-pools or privy vaults, 10 barnyards and 2 cemeteries which are liable to pollute the stream. At the time of the last inspection, the water contained a large amount of surface drainage from the surrounding country and was entirely unfit for a public supply. The inspection of June, 1905, showed that the water supply direct from the creek, and possibly the well water supply was liable to pollution from the flushing of cattle and hog trains on the Northern Ohio Railroad. These trains are flushed at the water tank, within a few hundred feet from, and at a much higher elevation, than the water-works property, and the drainage from them passes down the gully by the side of the railroad and into the stream just above the intake. The attention of the railroad authorities has been called to this practice and they have promised to discontinue it, but the last inspection showed no change in conditions.

The deep well supply derived from 5 driven wells, 80 to 105 feet in depth, located just north of the Northern Ohio Railroad, near the junction of the river and this railroad, in the southeasterly part of the village. These wells pass through 9 feet of clay, or clayey gravel, and the remainder through sandstone. Two of them are said to furnish no water. The amount derived from the remaining three is probably small. The use of these wells was never approved by the State Board of Health for the reason that definite plans, showing their location, were not submitted as requested in 1902.

Recently a large dug well, 15 feet in diameter, and lined with stone laid dry, has been installed at the same location. This well contains about 11 feet of water, which rises to within a few feet of the surface. This water is said to enter the well from all sides and is probably the sub-surface water from the surrounding territory. A strip of land, of probably  $1\frac{1}{2}$  acres in extent, bordering the creek, has been purchased by the village for water-works purposes. There are no buildings within 500 feet of the wells, with the exception of the pumping station and an electric railway sub-power station; the latter is within 200 feet of the



deep well and considerably above it. Underneath this building, a recently constructed sewer discharges into a ditch which leads to the top of the embankment just above the dug well and discharges on to the ground within 75 feet of the well. This sewer is laid presumably for surface and sub-soil drainage, but there were evidences at the outlet that it receives domestic waste, at least to the extent of sink drainage. About 100 feet in the other direction is the gully into which the flushings from the railroad trains are discharged as above described.

At the present time, the average daily water consumption is about 70,000 gallons, increasing to 100,000 gallons during certain dry periods. There are 190 taps, which make the water accessible to probably 800 people and perhaps 80 per cent. of the total population. It is claimed that very little is used for domestic purposes, but the local health officer has evidence to the contrary.

It is expected by some of the village officials that the new dug well, together with the old deep wells, will supply enough water so that the use of the unpurified creek water will be unnecessary. It is expected to install a special pump to deliver the creek water to the railroad and thus save the ground water; that no creek water will be used for domestic purposes. This fact is, by no means, definitely established, however.

The Board on May, 8, 1906, approved the use of water from the circular dug well, some 15 feet in diameter, and also from driven wells, some 80 feet deep, located in the southeasterly portion of the village, on land owned by the village, immediately north of the Northern Ohio R. R. and bordering the Huron River, provided:

1. That the sewer which now discharges at the top of the bank a few hundred feet northeast of the location be diverted and made to connect with the main sewer of the village.
2. That the drainage originating in the vicinity of the railroad water tank be conveyed through a properly constructed sewer and disposed of in connection with the remaining sewage of the village.
3. That no source of pollution which, in the opinion of the State Board of Health, would affect the quality of the water be permitted within 500 feet of any well used as a source of public water supply, and
4. That all direct connection with the creek, by means of which unpurified creek water can enter the distribution system, be cut off.

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## REPORT OF PROPOSED ADDITIONAL WATER SUPPLY FOR STEUBENVILLE.

On February 14, 1906, the superintendent of water-works and city engineer at Steubenville, requested the Board's approval of the use of a spring in the southwesterly part of the city as a source of additional



water supply. The engineer visited Steubenville February 23rd, made the necessary inspection with the following report:

Steubenville has had a public water supply since the year 1810, and the water-works have always been owned by the municipality. The source of supply has been the Ohio River. At present the water is raised into two reservoirs; one about 100 feet above the city and the other 250 feet above. The low pressure reservoir holds three days' supply and is used regularly; while the high pressure reservoir holds two days' supply and is used only in cases of fire.

The river water receives no treatment, except sedimentation in the reservoir, and is therefor usually objectionably turbid. It is also subject to sewage pollution.

It is proposed to convey the water of the Mackey Spring, so called, located on the high land in the southwesterly part of the city, into the low pressure reservoir by gravity.

The water of the spring at present issues from the sandstone rock into a shallow well and from there is conducted through a tile pipe, through the grounds of two private houses where it is used for domestic purposes. The spring is located about 50 feet south of Spring Avenue and there are about it, within 150 feet, five houses, while several more houses are located farther up the hill. These houses have privies, the liquid contents of which may leach into the same rock from which the water issues.

The analysis of a sample collected from the spring indicates some pollution which evidently enters the spring directly from the surface by reason of insufficient protection. In most respects the water would be satisfactory for a public supply. (For analysis see Laboratory Report on Water Supplies.)

The flow of the spring is only about 300 gallons per hour or 7,000 gallons per day. This would be only 0.3 of one per cent. of the total consumption. While the use of the spring might save a certain amount of temporary expense, yet this would be very small, and probably would not balance the interest on the money necessary to convey this spring water to the reservoir. Moreover by using the Mackey Spring, additional responsibility would be placed upon the water department in seeing that the surroundings of this spring were always such as to prevent local contamination; and this duty might be easily overlooked, and thus contaminated water would be allowed to reach the public supply from this source. Of course the Ohio River is at present contaminated, but it is hoped that proper filtration will be installed in the future.

At a meeting held March 16, 1906, the Board disapproved the spring, known as the Mackey Spring, as a source of additional water supply for Steubenville for the reason that the yield of the spring was so small in proportion to the entire water consumption, that its use would not warrant introducing a possible source of future contamination of the

public water supply, although the water in this spring at that time would probably not, if the spring were properly protected, be dangerous to health.

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### REPORT ON NEW WATER SUPPLY FOR WAUSEON.

On May 1st, 1906, Mr. Wm. G. Clark of Toledo, consulting engineer for the village of Wauseon, requested that certain proposed sources of water supply for that village be examined by the State Board of Health. On May 4th, 1906, the assistant engineer visited Wauseon and the following report was made:

The village of Wauseon is located in the south central portion of Fulton County, and has a population of about 3,000. It lies in the Maumee watershed and is drained by Turkeyfoot Creek, a small tributary of the Maumee River. In the vicinity of Wauseon, Ohio, shale lies about 140 feet deep and is overlaid by a thick stratum of clay to the surface and containing occasional seams of sand and gravel. Most of the private wells obtain their supply from the rock, the water being hard, somewhat impregnated with natural gas, and generally unsatisfactory for domestic and boiler purposes. The present public supply is derived from two wells located about one mile south of the village. These wells are driven into what seems to be an old river channel in the shale. This channel is filled with gravel and sand and was believed to hold large quantities of water. Such belief, however, proved to be erroneous, for the wells are now giving very nearly their maximum capacity and are supplying the village with but 150,000 gallons per day.

It is now proposed to abandon the present supply and secure a new supply which will be capable of yielding 1,000,000 gallons per day. For accomplishing this two projects are under consideration, discussed separately as follows:

*First Project.* About eleven miles northwest by west of Wauseon is a region of flowing wells from which it is believed an abundant supply can be obtained. In this project it is proposed to enlarge one or more of these wells and pump the water to Wauseon through a conduit, this conduit to be constructed of cast iron or more probably, of wooden stave pipe. While this source is practically sure to give an ample supply it is expensive to reach. Moreover, the water is hard and contains some sulphur and iron. However, as shown by the chemist's report, this water is superior to the present supply.

*Second Project.* A short distance north of Wauseon is an area of very fine sand, roughly, ten miles in diameter, deposited on top of the glacial drift. Shallow wells in this sand area give a soft clear water, in every way suited for domestic and industrial purposes. Unfortunately, the sand is so fine that these wells cannot yield a sufficient quantity of water for a public supply.

*Third Project.* Since wells are not feasible it is proposed to impound the water from one or several small streams flowing through the area. The two streams from which samples were taken are called Cooks Spring Branch and North Branch of Brushy Creek. A sample was also taken from Cooks Spring in which Cooks Spring Branch rises. North Branch of Brushy Creek also rises in a spring, and both streams have a flow throughout the entire year.

The greatest objection to the use of these surface streams as a source of supply is the impossibility of the village controlling the entire watershed and the further fact that they all run dangerously near farm houses at points above those proposed for taking the supply. At time of inspection the streams did not present a very wholesome appearance. For a large part of their length the fall was slight and the sides and bottoms contained rich vegetable growths. Quantities of iron growths were observed in Cooks Spring but this would probably be removed by natural aeration before getting into the pipes. The report of the chemist shows that the spring water is of good quality but that the streams contain considerable organic pollution. (For analysis see Laboratory Report on Water Supplies.)

The second project has the advantage of involving much less expense than the first and, furthermore, could be used as a temporary supply until the village required a larger amount of water, since the conduit from the impounding reservoir could later form part of the pipe line to the flowing well district. Otherwise there is little to recommend using these surface waters.

At the present time Wauseon can issue bonds to the extent of \$50,000 and while the engineer's estimate for the first project somewhat exceeds this amount it is believed by him that certain economies in construction will bring the cost within the limit.

At a meeting held June 19, 1906, the State Board of Health approved this project for obtaining a public water supply for Wauseon from flowing wells to be located in Franklin Township, eleven miles north of the village, provided detailed plans, showing definite location of the wells and surroundings, method of making connections with wells and method of conveying water to consumers, be submitted to and receive the approval of the State Board of Health before the water-works are built.

The plan for obtaining a water supply from Cooks Spring Branch and North Branch of Brushy Creek was not approved.

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## REPORT ON THE WATER SUPPLY OF WEST MILTON.

The assistant engineer, on December 29, 1905, inspected the water supply of West Milton.

The following report was made:

West Milton is a village of about 1,500 population in the southwest portion of Miami County and on Stillwater River. The topography of the village is slightly undulating with a general slope toward the river, which forms its eastern boundary. The neighboring territory is underlaid with a stratum of limestone rock only a few feet below the surface.

The village has no industries to speak of and the population is made up mostly of farmers and merchants.

The public supply at present in use is obtained from a spring located under a farm house; the water flowing by gravity, some three-fourths of a mile, to the pumping station. There are many private wells and springs in the village which are used for drinking and cooking purposes, whereas the public supply is used for other domestic purposes and sprinkling. The private wells are generally shallow, being sunk to the limestone stratum above referred to.

#### HISTORICAL.

The present water-works were completed in 1904. The first source of supply was Vore Spring, some half mile distant from the village in a southwesterly direction. This soon proved insufficient and an intake was laid to Rutledge Branch or Spring Branch, a small stream passing through the village. Later in the spring of 1905, Haskett Spring, the present supply, was placed in service and the old connections to Vore Spring and Spring Branch were removed.

*Sources of Supply.* The present supply is derived from a spring which is located directly under the farm house of P. J. Haskett, about one-half mile east of the village. This is one of numerous springs in the neighborhood which flow from the gravel deposits just below the surface layer of soil.

Sink wastes from the Haskett house are disposed of by throwing them out over the surface of the ground. The privy is about 75 feet distant on the uphill side of the house. These are the only sources of pollution in the immediate neighborhood; the country for nearly 1,500 feet in every direction being laid out in fields.

The Vore Spring, which was formerly used but proved insufficient, is on the Vore farm. The water is gathered by driven wells, 7 to 10 feet deep, and the entire volume of water was conducted to the pumping station without being exposed to the surface of the ground. At time of inspection the field in which the spring is located had been plowed over and the wells could not be found. This spring was approved by the State Board of Health in 1902 and recommendations were made for its proper protection from pollution.

Rutledge Branch is a small stream originating in springs and flowing through the village in an easterly and westerly direction. Above the point of former intake the stream receives no direct sewage pollution but receives large quantities of surface washings.



*Collecting Works and Distribution Reservoirs.* Haskett Spring, so-called, is a shallow well concreted over and the only access to it is through a manhole in the cellar of the Haskett house. There are two outlets leading from the spring; one being an 8-inch vitrified pipe extending to the pump well near the pumping station in the westerly part of the village, three-fourths of a mile distant, and the other a 1-inch galvanized pipe for supplying the Haskett house.

From the pump well the water is raised to an elevated steel tank. This tank has a capacity of 40,000 gallons, and has a high water level 145 feet above the ground, which is sufficient to maintain ample service pressure throughout the village.

*Quality of Water.* A sample from the Vore Spring was collected in October 6, 1902, just before the supply was approved. The sample was collected during a hard rain and contained surface washings which rendered the analysis less favorable than would have been the case had the water been sampled when in its normal condition. Considering the location of the Vore Spring and the conditions under which it was sampled the analysis shows a usable water for domestic purposes, relatively soft and suitable for use in boilers. (For analysis see Laboratory Report on Water Supplies.)

The Haskett Spring was sampled at time of inspection, December 29, 1905, and the analysis shows that the water at time of collection was satisfactory for domestic use with the exception of moderate hardness. There are in the analysis, however, indications that the water has at some time received pollution, presumably from the privy, barn and general drainage from the Haskett residence, but that this pollution had been well purified before the water reached the spring. Should the soil through which the water passes lose its purifying powers the spring would become polluted.

The appearance of the water is remarkably good and seems to give general satisfaction. It is claimed that the village is free from typhoid fever. There has been only one case reported since the water-works were installed, and there has been but one death from typhoid during the last eight years.

*Actions of the State Board of Health.* On October 20, 1902, the State Board of Health approved the plans of the engineer, Mr. John P. Force, of Columbus, for a water supply for West Milton. The source of supply in these plans was Vore Spring. Since the installation of the works water has been drawn from the Rutledge Branch and, subsequently, both Vore Spring and Rutledge Branch were abandoned and the entire supply taken from Haskett Spring. The two latter sources were used without submitting application to or receiving approval from the State Board of Health.

At a meeting of the State Board of Health held January 17, 1906, the Haskett Spring was disapproved as a source of supply and the dis-



continuance of its use ordered. The attention of the authorities was called to their failure to secure the Board's approval of their water supply and they were notified that a new supply should be sought at once, which must be satisfactory to the State Board of Health.

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## REPORT ON PROPOSED WATER SUPPLY FOR WOOSTER.

On June 4th, Mr. L. S. Cooley, president of the board of public service of Wooster, requested the approval of the Board of a source of water supply to be derived from wells in the southern portion of the corporation. On June 7th, the chief engineer visited Wooster, made the necessary inspection, collected samples of water from test wells and submitted the following report:

*Present Water Supply.* Wooster water-works were first installed in 1875. The present supply is obtained from the Redick reservoir, which is formed by a dam across Christmas Run, just north of the northerly city limits. The run above this point has a drainage area of about 8 square miles the population of which, including the County Childrens' Home, discharges sewage into the reservoir.

In 1881, a well 47 feet deep and 32 feet in diameter was dug in the northeasterly part of the city. This well extends through shale and clay into sandstone from which the water issues. The water is pumped into the Bloomington reservoir from which it is distributed by gravity to the city. The quality of this water is said by the professor of chemistry of the university to be quite safe, although it is injured physically by being stored in an open reservoir and subjected to algal growth. The capacity of this well, however, is only enough to supply about one-third of the total consumption.

In addition to these two sources, a pumping station is located by the side of the Apple Creek, in the southern part of the city, and below the point where it receives a considerable amount of drainage, and water is pumped from the creek into the city mains whenever the Redick resevoir runs low.

In 1894, an investigation into the proposed new supply was made by the Water Extension Commission and the scheme adopted by this commission was unqualifiedly approved by the State Board of Health, but, on account of its cost, nothing has been done in regard to installing it.

The above described supplies, therefore, remain in use and the contaminated water of Apple Creek has been used frequently, in spite of the warnings and disapproval of the State Board of Health.

At first a traction engine was used for pumping the water from this creek but afterwards a regular pumping station was built in spite of the disapproval of the State Board of Health.

The conditions, therefore, at Wooster in regard to the water supply are disgraceful and a menace to the health of both residents and strangers. It is very important that a proper supply be installed in the near future.

*Supply Now Proposed.* Within the last month, two wells, located in the narrow valley of Apple Creek, between the railroad and the highway, adjacent to the preserving works in the extreme southerly part of the corporation were put down. One of these wells, No. 1, is 120 feet deep, extending through 6 feet of loam, 20 feet of sand and gravel and below this alternate layers of sand rock and shale. Well No. 2, about 75 feet from No. 1, extended through the same material except that it does not pierce the sand rock and shale to as great a depth as the other.

These wells have been pumped together about 9 days and yield about 75,000 gallons per day each. The water stands normally about 6 feet from the surface but is lowered by pumping, at this rate, about 20 feet, at which elevation it remains. The wells at first were pumped too violently and easily exhausted. Both wells are cased for a distance of 25 feet below the surface.

The sand rock, alternate with shale, into which these wells are driven and from which the water is obtained, is not suitable for satisfactorily purifying any contaminated water which might reach it. As shown by the quarries in other portions of the city, the sandstone is of a rather coarse texture and contains many fissures in interstrata of shale and is very unfavorable towards affording purification.

The quality of the water, as shown by analysis, indicates some evidence of past pollution but it is safe to drink at this time. Nevertheless, from the nature of the material into which the wells are driven, it would seem possible that they might be contaminated in the future. (For analysis see Laboratory Report on Water Supplies.)

At a meeting held June 19th, 1906, the Board considered this source of water supply for the city of Wooster, to be obtained from driven wells in the valley of Apple Creek near the Pennsylvania Railroad in the southern part of the corporation, and it was disapproved, the examination made by the Board having shown that the water was not of good quality nor the location of the wells a favorable one.

SEWERAGE AND SEWAGE  
PURIFICATION.

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## REPORT ON PROPOSED SEWERAGE FOR DISTRICT NO. 1, OF BARBERTON.

January 10th, 1906, the city engineer of Barberton, made application for the approval of certain plans for storm sewerage in Barberton. The assistant engineer visited Barberton on January 16, 1906, obtained the necessary plans from the city engineer and made an inspection of the territory.

The following report was made:

The village of Barberton is in the southwestern part of Summit County and in the eastern part of Norton Township. The main portion of the village is built on a level plain in the valley of the confluence of the Tuscarawas River and Wolf Creek. The surrounding country is rather hilly. The area of the village within the corporation limits is 1.86 square miles. There are at the present time 7,956 feet of paved streets.

The first sewers of any kind were installed in 1895 and 1896. At that time a complete system of sanitary and storm sewers was laid out and subsequent construction has been carried out along these lines. H. W. Alcorn of Barberton was responsible for the design of the storm sewers while W. A. Johnson of Barberton designed the sanitary system. The storm water system is divided into four sub-districts, Nos. 1, 2, 3 and 4, of which No. 4 has been entirely completed, No. 3 is partially completed, No. 1 is now proposed and being legislated upon and No. 2 will not be considered until that portion of the village is more built up, and some of the streets have been paved. Each storm water district is to have a separate outlet and those already built, Nos. 3 and 4, have outlets into Wolf Creek and the Tuscarawas River respectively.

The system of sanitary sewers is designed ultimately to cover the whole village and bring all the sewage to one outlet. The most thickly settled portion of the village is now provided with sanitary sewers with the exception of those portions tributary to the private sewers of The Columbia Chemical Co., and The Stirling Consolidated Boiler Co.

### SEWERS.

The sanitary main sewers are made up as follows:

1,575	feet	24	inch	vitrified	pipe.
2,159	"	20	"	"	"
2,779	"	18	"	"	"
3,098	"	15	"	"	"
8,436	"	12	"	"	"
7,333	"	10	"	"	"
350	"	8	"	"	"
<hr/>					
25,730	"	Total.			



The 24-inch pipe constitutes the main outfall sewer which discharges into Wolf Creek just below the point where it is joined by Hudson Run. This sewer was badly broken during the past year by an explosion and is to be replaced by a 30-inch concrete conduit. All other sewers are in good condition. Joints are made with 1 to 1 Portland cement mortar and gaskets of jute.

The sewers are ventilated by perforated manhole covers, the manholes being placed at intervals of 300 feet and at all changes of direction. There are also a number of lamp holes with perforated covers which assist the ventilation.

Flush tanks are placed at the ends of all sewers and are discharged about once per hour. Miller and Van Vranken discharging apparatus are used and the latter are said to cause the less trouble.

All house connections are made under the supervision and to the satisfaction of the sanitary policeman. There are no printed rules for his guidance but in general all connections are of 4-inch vitrified pipe, or larger, and are trapped just inside the walls of the house.

None of the sewers are underdrained as this was not found necessary. There are no inverted siphons or other unusual features in sewer construction.

The wastes taken care of by the sanitary sewers include the ordinary domestic wastes and cellar drainage.

#### STORM SEWERS.

Sub-district No. 4 of the storm water sewers, which has been completed, is made up as follows :

450	feet	30	inch	vitrified	pipe.
306	"	24	"	"	"
244	"	20	"	"	"
606	"	18	"	"	"
2,113	"	15	"	"	"
3,156	"	12	"	"	"
2,449	"	10	"	"	"
606	"	8	"	"	"

The outlet to this district consists of two 20-inch cast iron bell and spigot pipes. Cast iron pipes are used as the lower portion of sewers passes under railroad tracks. Sub-district No. 3, which has been but partially completed is made up as follows :

940	feet	of	30	inch	concrete	conduit.
298	feet	of	20	inch	vitrified	sewer pipe.
40	"	"	15	"	"	"
630	"	"	12	"	"	"
456	"	"	10	"	"	"

The 30-inch concrete conduit constitutes the outfall which discharges into Wolf Creek.

Sub-district No. 1 is to be built as soon as the necessary legislation is passed and the approval of the State Board of Health received. As planned this district is made up as follows:

1,200	feet	24	inch	vitrified	sewer	pipe.
670	"	20	"	"	"	"
1,360	"	15	"	"	"	"
1,400	"	12	"	"	"	"
7,650	"	10	"	"	"	"
80 catch basins and 29 manholes.						

This district is to have its outlet in Wolf Creek at a point shown on map.

All storm water sewers are constructed in essentially the same manner as the sanitary sewers, that is with joints made of 1 to 1 Portland cement and jute gaskets. Manholes are placed at all changes in direction and lampholes wherever deemed advisable. House connections are made for carrying off storm water from roofs, these connections being usually direct and without traps. Catch basins are placed at convenient points to carry off street washings. These for the most part are untrapped. They are simple in construction, consisting of a 24-inch vitrified tee with a 10-inch side outlet. The catch basins put in place recently, and which are to be used in the future, are made of a vitrified pipe Y.

The maintenance of the sewerage system is intrusted to the chief of the fire department. No regular force is maintained for this work, and the repairs made and stoppages cleared amount to practically nothing. The few stoppages on record have been due to the throwing of improper material into the water closets. The only regular work required in the sewers is the cleaning of catch basins and this is done by laborers employed as required.

#### AMOUNT AND CHARACTER OF SEWAGE.

No measurements have ever been made either on the flow of sanitary or storm water sewage, nor was it possible to obtain even a closely approximate estimate thereof.

Records of connections are kept since a permit must be issued by the mayor for each connection put in place, but these records do not include a large unknown number that were put in place at the time the sewers were constructed. No factories contribute any larger amount of industrial wastes to the sewers, since most of these have private sewers and drains either into the Tuscarawas River or into Wolf Creek.

An examination of outlets showed but small amounts being discharged from the two storm water sub-districts and this was so clear as

to have the appearance of spring water. The inspection was made during continued cold weather and the ground was covered with snow. In warm weather during a storm conditions would no doubt be quite different, but there was no evidence on the stream bank that there had at any time been gross pollution. Both storm water outlets discharge above the water level in their respective stream.

The sanitary sewer outlet enters the stream below the water level and cannot be seen. The sewage rises to the surface and marks the point of discharge. Its presence in the stream, however, can be noticed for a distance of only 40 to 50 feet below the sewer outlet, because Wolf Creek at this point is very greatly discolored by manufacturing wastes from the Columbia Chemical Co. No odor of the sewage was perceptible in the neighborhood but this was probably due to the very low temperature and the presence of lime from the chemical works.

#### PRIVATE SEWERS.

There are two private sanitary sewerage systems in the village, namely, that of the Columbia Chemical Co. and that of the Stirling Consolidated Boiler Co.

The Chemical Co. has in reality two sanitary sewerage systems one for the tenements and the other for the works. The former cares for a sewage of some 400 persons and discharges into Hudson Run about 5,000 feet above its entrance into Wolf Creek. The flow of sewage is small and at the time of inspection had very little effect on the appearance of the run. These sewers are all of vitrified tile pipe and constructed in an approved manner.

The sewage from the works enters the drain which carries manufacturing wastes to Wolf Creek.

The Stirling Consolidated Boiler Co.'s sewer has been built to care for the sewage from the works and perhaps several tenements. Ultimately it will receive the sewage from about 1,000 employees.

The sewer is substantially built of vitrified sewer pipe. The outfall is 15 inches in diameter, protected by a substantial concrete abutment and discharges into Wolf Creek just below and on the opposite bank from the outlet for the wastes of the Columbia Chemical Co. The outlet is submerged and owing to the previous pollution of the stream will probably have but small effect on the appearance of the water.

Vaults and privies are but little used at the present time within the village limits.

#### INDUSTRIAL WASTES.

The greatest pollution of the streams by industrial wastes is caused by the Columbia Chemical Co. In the neighborhood of 6,000,000 gallons of wastes daily are discharged into Wolf Creek. These contain salt calcium compounds and other substances the nature of which could not

be learned. They render the creek dark and dirty and all water vegetation has been destroyed. No perceptible odor was noticeable and no complaints of such have been heard. It is even quite likely that the calcium content may have some effect in preventing odors.

Much of the waste from the chemical works is discharged into a large lake, (marked on the map "White Lake"), in the form of a white liquid. Much of this solidifies forming a hard white rock. The water is permitted to drain away into Hudson Run and greatly discolours that stream just above the point where it joins Wolf Creek. It can hardly be said that the wastes from the chemical company cause a nuisance, but they do mar the appearance of the water. A visit in the summer time during a period of low water would throw more light on the subject.

Wastes from the mill of the American Strawboard Co. are said to seriously pollute the Tuscarawas River when the mill is in operation. At the time of visit this mill was shut down and the river was free from offensive matter. The river bed, however, showed marked evidence of past pollution in the filthy mud that lined it.

The Diamond Match works discharges small amounts of wastes into the marshes bordering on the river but these do not affect the stream in appearance at all.

A glance at the Tuscarawas River obtained from the railroad train some five or six miles below Barberton showed the stream to have regained its normal appearance.

March 3rd, 1906, the Board approved this proposed storm sewer for District No. 1, with an outlet into Wolf Creek in the northwesterly part of the village; it being understood that these sewers are to be used for storm water purposes only.

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#### REPORT ON PROPOSED DOMESTIC SEWER FOR THE STIRLING CONSOLIDATED BOILER WORKS OF BARBERTON.

On January 13, 1906, The Stirling Consolidated Boiler Company, at Barberton through its superintendent, Mr. L. L. Summers, made application to the State Board of Health for approval of a proposed domestic sewer to be used by the employes of the works and their families, and to discharge into Wolf Creek near the works in the southern part of the village. The assistant engineer visited Barberton, January 16, 1906, made the necessary inspection with the following report:

The sewers are made of vitrified tile pipe with cemented joints. There are 2,375 feet of 15-inch diameter pipe and 550 feet of 10-inch diameter pipe. The sewage is to be discharged untreated into Wolf Creek. The outlet is well protected by a heavy wall of concrete. No provision has as yet been made for flushing the sewers.



The sewer is ultimately to be used by 1,500 persons and for sanitary purposes only. Wolf Creek is a small tributary of the Tuscarawas River and has a flow of perhaps 8,000,000 gallons per twenty-four hours. Just above the entrance of The Stirling Consolidated Boiler Works sewer the Columbia Chemical Company discharges large quantities of manufacturing wastes, containing much lime and perhaps some caustic soda. The stream has an evil appearance but no disagreeable odors arise therefrom. About 1,000 feet below the boiler works sewer Wolf Creek is joined by Hudson Run, which also carries considerable waste (largely calcium compounds) from the chemical works. Just below the confluence of these two streams the entire domestic sewage of Barberton is discharged. As the water is already highly colored and opaque the sewage has but little effect on its appearance. Below Barberton Wolf Creek joins the Tuscarawas River, a stream of somewhat larger size, which flows through sparsely settled country to Clinton, 5 miles below Barberton. At Clinton the river showed but little effect of its previous pollution.

These plans were approved by the Board, March 13, 1906, provided the Stirling Consolidated Boiler Company agreed to purify the proposed sewage in a manner satisfactory to the State Board of Health, whenever sewage disposal works for the village of Barberton are installed, or to connect with such disposal works.

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#### REPORT ON PROPOSED DISPOSAL OF SEWAGE FROM THE HOUSES BELONGING TO THE INTERSTATE ENGINEERING COMPANY AT BEDFORD.

On January 19, 1906, complaint was received from a resident of Bedford, stating that the sewage from houses belonging to The Interstate Engineering Company was being discharged into a small stream passing through the property of Mrs. F. G. Bissell and was creating a nuisance. The assistant engineer visited Bedford on January 30, 1906, made the necessary investigation, and the following report was made:

The Interstate Engineering Company has discontinued, or is about to discontinue, the discharge of sewage in the manner complained of, and instead, propose to pump such sewage into the main channel of Tinkers Creek at a point about 1,600 feet north of the present outlet.

Previous to adopting this scheme, the company considered the project of purifying the sewage in the immediate vicinity of its houses. This idea was abandoned on account of its high cost.

The Interstate Engineering Co. of Bedford has built about 20 residences near their works, and provided them with a system of sanitary sewers, which until recently had its outlet in a small ditch passing through the property of Mrs. F. G. Bissel and thence to a pond owned by Paul



Schneider, an officer of the engineering company. The pond has an outlet in Tinkers Creek, a large stream emptying into the Cuyahoga River. The total distance from the sewer outlet to a point where the ditch enters Tinkers Creek is about 2,000 feet. It is claimed the ditch carrying sewage and passing through the land owned by Mrs. Bissel for a distance of some 500 feet causes a nuisance and prevents the grazing of cattle in the adjacent fields. At the time of examination it was found that The Interstate Engineering Co. was taking steps to stop the discharge into this ditch, by pumping the sewage to a sufficient elevation for it to flow by gravity through a pipe line into Tinkers Creek.

The installation consists of two small settling tanks and a suction well of wooden construction, banked up with earth; a small power pump, and a 1,600 foot line of 6-inch vitrified pipe. The flow of sewage at the time of inspection was quite small, hardly exceeding 2,000 gallons per day.

The discharge into Tinkers Creek is some 15 feet above the water level, but is in such a locality that even should the sewage spray flow over the rocky bank into the stream, no serious nuisance would be caused.

Tinkers Creek, below the point at which it is now intended to discharge the sewage, is located in a deep gully and there are no houses within several hundred feet of the creek for several miles down stream. If the sewage is properly mixed with the current, therefore it will probably not be objectionable for many years.

However, should such an outlet be objected to it would be a simple matter to extend the pipe down the face of the bank into the water. The discharge of Tinkers Creek at low water is probably in the neighborhood of 4,000,000 or 5,000,000 gallons per day, and is therefore ample to care for the sewage.

April 6th, 1906, the State Board of Health approved this system of sewage disposal adopted by the Interstate Engineering Company providing for the discharge of sewage into Tinkers Creek at a point near the easterly corporation line of Bedford, provided:

1st. That the outlet consist of iron pipe which will discharge the sewage below the surface of the creek at all times; and,

2nd. That sewage purification works be installed whenever this shall be deemed necessary by the State Board of Health.

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## REPORT ON PROPOSED SEWER FOR THE SOUTHWESTERN DISTRICT OF CAMBRIDGE.

On February 12, 1906, the mayor of Cambridge, Dr. W. N. Bradford, submitted an application for the Board's approval of a new sewer in the southwestern portion of that city. The chief engineer visited Cambridge

on February 24, 1906, and was shown about by the mayor, superintendent of water-works and two members of the board of public service. The following report was made:

#### PRESENT CONDITIONS.

At the present time Cambridge, with an estimated population of 10,000, has some four or five miles of sewers, used by 600 to 1,000 people. There is but one outlet and that is into Wills Creek at a point well below the built-up portion of the city. This sewer outlet was built in 1899. Plans for it were submitted to the State Board of Health but no definite action was taken upon them.

The sewer at present discharges into the middle of the stream, below the surface, through an iron pipe, and is thoroughly mixed with the current. Between one-fourth of mile and one-half mile below the outlet there are about a dozen houses within a few hundred feet of the stream. The Cambridge plant of the American Sheet Steel Company is also located about one-half mile below the outlet. A dam has been constructed across the river opposite the mill for the purpose of obtaining water for the boiler. No evidence of sewage contamination of the stream could be found anywhere at the time of inspection, and so far as could be learned there have been no complaints on account of the present discharge of sewage.

The steel mill, itself, discharges drainage from its water closets into the stream, and in addition a certain amount of acid iron waste or solution of copperas is discharged. The factory is said to use 14,000 pounds of sulphuric acid per day and this, after being used, is discharged into a large settling basin where a considerable portion of it evaporates. It is claimed by the city authorities that the discharge of this acid waste has a beneficial effect upon the sewage contained in the stream. This statement is based entirely upon theory, for there have been no investigations to prove that this is so.

Inspection by the State Board of Health in 1899 and a chemical examination of the river above and below Cambridge, show that the stream during the season was not being seriously polluted. The long continued and extremely turbid condition of the water in Wills Creek makes sewage pollution comparatively hard to detect with the eye. The chemical examination made in 1899 showed that the amount of dissolved oxygen in the river water is comparatively small, so that its capacity for purifying sewage is not great.

#### PROPOSED PLANS.

It is proposed to build a sewer for the accommodation of the south-westerly district of Cambridge. This district contains about one-third of the entire population of the city, or 3,000 people, and is in great need of

sewerage. The sewer is to be upon the separate plan and is to discharge into Wills Creek at the location of the present outlet.

As mentioned above the discharge of Wills Creek at the time of inspection was unusually great, and therefore conditions were not suitable for passing final judgment upon the question of whether or not the proposed sewer would create a nuisance. From the information available it is unlikely that this would be the case for at least some years.

The Board, March 1, 1906, approved this new sewer in the southwestern portion of Cambridge, for the discharge of domestic sewage into Wills Creek at a point near the present sewer outlet, from the north side of the city of Cambridge upon the conditions:

1st. That the proposed sewer be constructed at such elevation that the sewage can be easily passed through purification works before discharging into the stream when it becomes necessary to construct such works; and,

2nd. That sewage purification works, satisfactory to the State Board of Health, be constructed whenever in the opinion of said Board such works become necessary.

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## REPORT ON PROPOSED SEWAGE DISPOSAL AT CHARDON.

At a meeting of the State Board of Health held June 19, 1906, Mr. Robert S. Parks, village clerk, and Mr. E. S. F. Phelps, village engineer, of Chardon, submitted general plans for disposing of the sewage of a portion of that village. On June 23, 1906, one of the special assistant engineers visited Chardon and made an examination of the proposed scheme. Amended plans for sewage purification were submitted on July 27, 1906.

The following report was made by the chief engineer:

Chardon is a village of about 1,300 inhabitants, located in the northern part of Geauga County. It has at present no public water supply and no general sewerage system.

From information obtained by the special assistant engineer, it appears that there has been recently constructed, or is now being constructed, a 15-inch drain about 2,000 feet long which will receive the sewage from one business block, one hotel, and about ten residences in the central portion of the village. This drain is to discharge at the disposal works located on low land about one-quarter of a mile southwest of the center of the village. The population to be provided for at present by these works is about 200. As there is no public water supply, the sewage will be highly concentrated, and the total quantity will be small.

According to plans submitted there is to be a settling or septic tank holding 2,250 gallons from which the sewage will pass into a dosing tank, and thence on to the filter beds of sand underlaid by gravel and

screened cinders. It is proposed to build four of these beds, each 8 feet square and  $4\frac{1}{2}$  feet deep.

Owing to the probable strength of the sewage it would be better, from the standpoint of the creation of odors, not to retain it in the septic tank, but to discharge it by means of the dosing tank on to the filters and allow it to disappear from the surface before it has had time to putrefy. This method will require more frequent cleaning of the surface of the filters, but on the whole will be more satisfactory. The area of the filters shown by the submitted plans is entirely too small and should be increased.

The Board considered the plans submitted July 27, 1906, by the village engineer, Mr. E. S. F. Phelps, for a sewage disposal plant for a portion of Chardon, about one-quarter mile southwest of the center of the village, and they were on August 10th, 1906, approved, provided:

- 1st. That the construction of the septic or settling tank be omitted.
- 2nd. That a dosing tank holding about 1,000 gallons be installed and provided with an automatic siphon of a design satisfactory to this Board.
- 3rd. That there be constructed four filter beds, each containing an area of not less than 500 square feet.
- 4th. That samples of filtering material be submitted to the State Board of Health for approval before placing any material in the filters.
- 5th. That any enlargements, changes in construction or in methods of operation be made when directed by the State Board of Health.

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## REPORT ON PROPOSED STORM SEWER FOR CHURCH AND MILL STREETS, CHILLICOTHE.

On November 13, 1906, Mr. H. M. Redd, city engineer of Chillicothe, submitted plans for proposed storm sewer in that city, to be located in Church and Mill streets and to discharge into the Scioto River at the foot of Mill Street. The area to be drained was about sixty acres of incompletely built-up territory, containing a comparatively small proportion of paved streets. The upper portion of the sewer was to be 30 inches in diameter, and the lower end 24 inches in diameter; this reduction of size being permissible on account of the very steep grade in the last portion of the sewer. The estimated cost was \$5,000.

November 19, 1906, the Board approved these plans, provided, that no domestic sewage of any kind be allowed to enter this sewer, and that this restriction be plainly set forth in the ordinance under which the sewer is to be built.



## REPORT ON PROPOSED STORM WATER SEWER IN HONEY CREEK, CHILLICOTHE.

On June 2nd, 1906, notice was received that the city of Chillicothe intended to construct a storm water sewer in Honey Creek and on June 5, 1906, the assistant engineer visited that city and made the inspection necessary for acting upon the proposed plans. The following report was submitted:

The city of Chillicothe is located in the eastern central portion of Ross County on the Scioto River and Paint Creek. The main portion of the city stands on comparatively low level land lying between the river on the north and the creek on the south, the two streams flowing nearly parallel at this point. The general slope of the built-up portion is toward Paint Creek rather than toward the river. The surrounding country is very hilly though there is considerable level land in the stream valleys. The city seems to be underlaid by gravel varying in size from coarse sand to small boulders. The surrounding hills are composed, for the most part, of shale. The area of the city within the corporation limits is 2,030 acres and the population is estimated at about 13,000. Many of the streets are well paved and the city in general presents a clean and well kept appearance.

The largest industries in the city are a paper mill, a cannery and railroad shops. Besides these there are several medium-sized flouring mills.

The city has a system of sanitary sewers that is gradually being extended in accordance with a plan for ultimately sewerage the whole city in such a manner that the sewage may all be brought to one point on Paint Creek and there treated before being discharged into the stream. The sanitary sewers now have three temporary outlets, one into Paint Creek and two into the Scioto River. The flow from these outlets is as yet so small that the flow in the respective streams is well able to care for it without causing a nuisance. Storm water in the city is taken care of by means of a number of storm water drains and Honey Creek which passes through the city in an open ditch and is tributary to Paint Creek. During the summer months Honey Creek is generally dry but in times of heavy rains the depth of water may be as much as five feet. As it passes through the built-up districts the banks are protected by rubble masonry laid dry and portions are covered over with boards. Here and there are seen small piles of rubbish in the bed of the stream though the local authorities make ever effort to prevent such practices and near the southern portion of the town there are low points in the bed which contain stagnant water. About 1,000 feet above its entrance into Paint Creek, Honey Creek receives the waste from the paper mill. This waste amounts to about 500,000 gallons per day, it is of a light gray color and is heavily



laden with suspended matter. Much of this is deposited in the stream bed but is said to be completely washed out during the storms.

*Proposed Sewer.* It is proposed to carry Honey Creek, for 1,500 feet of its length in the southern portion of the city, through a re-inforced concrete sewer or more properly a conduit, in order that the water may be carried off more rapidly and at the same time do away with the construction and unsightliness now caused by the open ditch.

In addition to the paper mill waste and storm water from five short storm sewers, this sewer is to carry only the natural flow of the stream which is derived from the watershed of 1,200 acres and has a computed maximum discharge of 150 cubic feet per second. The sewer has a sectional area of 40.4 square feet and a grade of 0.22 per cent., thus giving it a capacity when three-fourths full of 300 cubic feet per second which will be seen to be ample.

The introduction of this sewer will in no way change the amount or kinds of wastes now reaching Paint Creek. At time of examination the water in Paint Creek was quite low but no nuisance was caused.

At a meeting held June 19th, 1906, the State Board of Health approved the plans for a storm water sewer to be built in Honey Creek, submitted June 5th, 1906. This sewer is not used for domestic purposes.

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## REPORT ON PROPOSED SEWERAGE AND SEWAGE DISPOSAL FOR COLUMBIANA.

On July 23rd, 1906, Mr. E. G. Bradbury, consulting engineer for Columbiana, submitted plans for a sewerage system and sewage disposal plant for that village. A general description, containing data relating to the project, was also submitted. The following report was made:

*Present Conditions.* Columbiana is a village of 1,500 inhabitants in the northerly part of Columbiana County, upon the watershed of Mill Creek which enters the Mahoning River near Youngstown. The village is located upon a knoll, the highest point of which is in the center of the town, so that the drainage leads in all directions. The principal industries of the village are the manufacture of iron and wooden goods.

The village owns a water supply derived from a well 30 feet in depth, blasted in the rock. The present daily average of water consumed is 75,000 gallons. The water supply is used by 90 per cent. of the population, and the average daily consumption per capita is 50 gallons. All services are metered.

There are at present no sewers in Columbiana, although the two, small, intermittent streams which flow along the edge of the town are more or less polluted by private drains. These two small streams join at the northwesterly edge of the corporation and a short distance from this point enter Mill Creek.

*Proposed Plans as Submitted.* The consulting engineer has submitted plans for a complete sewerage system, covering practically the entire area of the village. By locating the main sewer along the base of the hill on which the village is located, it is possible to collect the sewage at one point in the northwesterly section of the corporation, and there purify it on land bordering Mill Creek.

The main sewer will be 15 inches in diameter, and will have a minimum grade of 2 feet per thousand. The sewers are designed to run half full, when the contributing population shall have increased to 9,000, on the basis of 50 gallons per capita.

The customary features of manholes, flush tanks, straight lines and grades, etc., are incorporated in the design. The sewer will be ventilated through the house soil pipes, there being no traps on the main house connections.

The site for the disposal plant, as above mentioned, will be in the northwesterly part of the corporation, adjacent to the banks of Mill Creek. The area of land to be purchased by the village has not yet been decided upon. The nearest houses to this site at present are nearly half a mile distant in a southeasterly direction, the nearest street is within one-quarter of a mile of the plant, and it is probable that houses will be located upon this street sometime in the future. The location proposed for the disposal plant is, therefore, satisfactorily removed from habitation.

As there is a possibility of the water of Mill Creek being used as a public supply for Youngstown, the sewage of Columbiana should be purified in the best practicable manner. The proposed method, therefore, of purifying the sewage by intermittment filtration through fine coke breeze, would undoubtedly yield a satisfactory effluent.

The plans for the sewage disposal plant, as submitted, may be described as follows: The sewage from the main sewers will enter a screen chamber and pass through a screen composed of parallel iron bars one-half inch apart. This screen will be raked daily or oftener by an attendant and the screenings thrown out upon the ground. From the screen chamber the sewage will pass into a sedimentation reservoir 40 by 36 and 7 feet deep. This reservoir is divided in half by a central longitudinal wall and will be covered. The capacity of this reservoir is about 75,000 gallons, so that with a daily flow of sewage of 75,000 gallons, the time of retention of this sewage would be 24 hours.

From the reservoir the sewage overflows into a dosing chamber, the dimensions of which are 40 feet by 16 feet by 3½ feet, and which holds 16,800 gallons. Leading from this tank is a 24-inch sewer, 300 feet long, terminating in a gate chamber which is located in the center of the filtering area. In this gate chamber there is to be a compartment containing two alternating siphons, which will control the discharge of the contents of the above mentioned dosing chamber as well as the sewage stored

in the 24-inch pipe leading to the filters. The size of the dose will, therefore, be 25,000 gallons.

The filters are to be four in number, each 104 feet square, and divided for dosing purposes into sets of two. Combined area is about one acre. The controlling device is so arranged that a dose may be discharged alternately upon two beds, one in each set. The average depth of the filtering material will be three feet, and each filter will have two lines of 6-inch underdrains and one distributing sluice.

The filtering material is to consist of a fine coke breeze similar to the material which has been used for several years, under the observation of the State Board of Health, at the Trumbull County Infirmary, near Warren. This material has produced an excellent effluent when treating strong, septic sewage at a rate of nearly 75,000 gallons per acre per day. This rate is proposed for use at Columbiana.

*Present Constructions.* As there are no sewers at present at Columbiana, the amount of sewage for several years will be very small. It is desired, therefore, to omit the construction of the settling reservoir at present; but to install the entire area of filters, and the dosing tank and screen chamber. This arrangement will provide ample area for securing, even with an unsettled sewage, a satisfactory effluent for several years in the future.

August 1, 1906, the Board approved the plans for sewerage and sewage disposal for Columbiana, as shown upon plans submitted by Mr. E. G. Bradbury, consulting engineer, on July 23rd, 1906; provided,

1st. That the operation and management of the sewage disposal plant be at all times satisfactory to the State Board of Health.

2nd. That any changes in or enlargement of the plant be made, when deemed necessary, by the State Board of Health.

3rd. That samples of the filtering material be submitted to the Board for approval before it is placed in the filters.

4th. That the village purchase or obtain control of, as a site for the sewage disposal works, an area of land of such size that the filters may be placed at least 300 feet from any of its boundaries.

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## REPORT ON PROPOSED SEWER FOR A PORTION OF DISTRICT NO. 1, CONNEAUT.

On August 3rd, 1906, plans for sewerage for a portion of District No. 1, Conneaut, were submitted by Mr. H. G. Kingdon, city solicitor. One of the special assistant engineers, while in Conneaut, September 13th, made an inspection of the conditions involved and found that they were accurately described in the information submitted by the city engineer, Mr. T. F. Lininger. The following report was made by the chief engineer:

The present sewers at Conneaut are largely on the separate plan and discharge into Conneaut River. The present total length of sewers is about 10 miles, and they are used by some 2,000 people. The sewage causes no visible nuisance in the river on account of the large dilution which takes place, due in part to back water from the lake; but the total pollution which the river carries into the lake probably has some effect on the water supply, at least at times. A new breakwater is now being constructed, however, which will cause the river to discharge farther out into the lake and thus reduce the danger of pollution to the water supply. Furthermore, it is probable that our recent examinations of the water filtration system will lead to better efficiency in purifying the water.

The State Board of Health approved additional sewerage projects in 1900 and 1901, subject to the condition that sewage purification works be built when deemed necessary.

The proposed sewer now under consideration is to serve the portion of Sewer District No. 1 in the vicinity of Main Street. This area is in the extreme southerly portion of the village and is about one and one-half miles, by river, from the lake.

The present population of the district for which the sewer is proposed is about 180, and it is estimated that the population will not exceed 700 for a very long time in the future. The sewer is to consist of 100 feet of 40-inch cast iron pipe; 200 feet of 10-inch tile pipe and 3,200 feet of 8-inch tile pipe. Only about 1,600 feet of the latter size will be built at once. The sewer will be ventilated through manholes and through main soil pipes at each connection.

The Board, on September 26, 1906, approved the proposed sewer outlet for the portion of District No. 1 in the vicinity of Main Street, as shown on plans submitted by Mr. H. G. Kingdon, city solicitor, on August 3rd, 1906, provided:

1st. That sewage purification works, of a design satisfactory to the State Board of Health, be constructed when deemed necessary by said Board for the purification of the sewage of the district now under consideration, as well as that of districts where sewer outlets have previously been approved with similar conditions; and,

2nd. That the proposed outlet be continued by means of an iron pipe to a point below low water level in the river.

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#### REPORT ON PROPOSED SEWER OUTLET FOR COVINGTON.

In response to an application from Mr. J. L. Cramer, a citizen of Covington, May 18, 1906, for the Board's approval of a proposed or suggested sewer outlet for that village, the assistant engineer made the necessary inspection on May 31, 1906, with the following report:



Covington is a village of about 2,000 inhabitants in the northwestern portion of Miami County and lies on the Stillwater River near its junction with Greenville Creek. Above Covington both the river and creek receive considerable sewage pollution. Below this point the river is not used as a source of water supply. The topography of the immediate neighborhood is undulating to hilly. Covington is a farming center and has no manufacturing industries. It is provided with a public water supply drawn from wells driven into the low land lying west of the Stillwater River. These wells, of which there are six, are anywhere from 50 to 100 feet in depth and give a water of considerable purity from a sanitary point of view, though it contains considerable hardness. The water-works are also provided with an emergency intake in the Stillwater River which was put in place in opposition to the State Board of Health but which has recently been placed under lock and key by order of the State Board of Health, so that it cannot be used except in times of great fires, and it must then be unlocked by the health officer who has custody of the key.

The village has no regular system of sewers though there are several storm water drains which discharge either into the Stillwater River or a small open ditch running through the village. These sewers and also the ditch itself are used to some extent for carrying off domestic sewage. The ditch, as well as several of the storm water drains, enters the Stillwater River above the emergency intake. Since the water supply has been installed, the needs for a system of sanitary sewers have been very greatly felt, but the village debt, owing to water-works and other improvements, has been so great that this could not be undertaken by the municipality. Therefore, a number of citizens, owning property in the business section of the village, have formed a company for the purpose of constructing a sanitary sewerage system which is primarily for their own use but which will be built of such dimensions that it may be extended and used by practically the whole population in the central portion of the village. As yet the services of an engineer have not been secured for designing and estimating the probable cost of this improvement, since the promoters first wished to obtain the approval of the State Board of Health and of the local authorities. In general, however, it is intended that this system of sewers shall be used for sanitary purposes only, shall be constructed of vitrified sewer pipe, laid with cemented joints; that the outlet shall be of cast iron pipe, with leaded joints, and shall extend out into the middle of Stillwater River to a point some 60 or 70 feet below the emergency intake of the water-works. At this point in the river there is a small rapids having a fall of perhaps a foot, and it is believed that sewage discharged into this rapids cannot return to flow over the emergency intake. An inspection would indicate this to be the case but it would be wise to carry the outlet near the lower end of the rapids, which would be only a matter of about 25 feet additional pipe. The outlet has another



advantage in that there are no dwellings within several hundred yards, with the exception of the pumping station.

In the beginning it is expected that 40 or 50 persons will be connected with the sewer system and for this number the stream is at all times well able to take the discharge without causing a nuisance. If, however, the system is extended to take in a much greater population, purification of the sewage may become necessary or at least advisable. It would, therefore, be good policy to so design this system that the sewage could be conducted to a disposal plant, by gravity, and also in such locality that the sewage of the entire village (should sewers be ultimately constructed for all parts), can be brought to one outlet. This would not seem to be difficult of accomplishment since nearly the whole of the village lies at least 30 feet above the water in the river. As far as could be judged, without having reference to a topographical map of the village, the present outlet would fulfill the conditions above outlined, since there is considerable uninhabited land in the neighborhood which might be secured for locating a sewage treatment plant.

June 10, 1906, the State Board of Health approved this proposed outlet for a private sewer system, as shown on sketch submitted May 18th, 1906, by Mr. J. C. Cramer, provided:

1st. That definite plans and specifications be submitted later for approval by this Board and that these plans and specifications provide that the outlet be located at such point that the sewage, from the entire village can, when necessary, be drained to it;

2nd. That this outlet be located at least 150 feet below the emergency intake of the village water-works.

3rd. That the main sewer be of such a grade that it can be easily continued to a proper site for a sewage purification works in the future; and,

4th. That sewage purification works, of a design satisfactory to the State Board of Health, be installed and placed in operation whenever this is deemed necessary by said Board.

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#### REPORT ON PROPOSED AMENDMENT TO SEWERAGE PLANS FOR CUYAHOGA FALLS.

At a meeting of the State Board of Health held in Cleveland on April 18th, 1906, a committee consisting of Dr. W. A. Searle and other citizens of Cuyahoga Falls appeared before the Board to request approval of modifications of sewerage plans already approved. Their application was referred to the chief engineer of the Board for investigation and report. He visited Cuyahoga Falls on May 3, 1906, and the following report was made:

Plans and specifications for a complete system of sewerage for the village of Cuyahoga Falls, drawn by Snow and Barbour, consulting engineers, were submitted to the Board in August, 1903. These plans provided for collecting the sewage in two intercepting sewers, one on either side of the Cuyahoga River (which flows in a southerly direction through the center of the village) and discharging it into two outlets, one on either side of the stream, below the lowest dam and also below the thickly settled part of the village. The easterly outlet was to be about 600 feet down stream from the westerly one. The plans were approved in August, 1903, subject to the following conditions:

1st. That the sewer outlets be of iron pipe carried over the gorge discharging into the river.

2nd. That the village agree to purify the sewage in a manner satisfactory to the State Board of Health, when, in the opinion of said Board, such purification shall be deemed necessary.

These plans have never been carried out, although the need of proper sewerage is urgent, as the public water supply is in general use and the use of cesspools about the village is fast becoming a great menace to health.

The citizens of Cuyahoga Falls, not wishing to spend any more money than is absolutely necessary for the purpose of getting rid of the filth of the village, desire to amend the above mentioned plans so as to avoid the construction of either of said intercepting sewers, as the geological formation beneath the village, being largely rock, makes excavation unusually expensive.

The committee desires that the village be allowed, therefore, to build domestic sewers in certain districts to discharge the sewage, at least temporarily, through five different outlets, two on the westerly side and three on the easterly side of the river, opposite the most thickly built-up portion of the village. These outlets would be above several dams and the sewage would at times, be discharged into practically still water, as the flow of the river in dry weather is held back, during the night at least, by the uppermost dam in the river. The committee suggests that the sewage would be discharged through submerged outlets and not allowed to trickle over the bank and that the depth of the river below the general level of the village (probably 30 or 40 feet at the proposed points of discharge) would prevent objectionable conditions. It is argued that a certain amount of sewage is already disposed of in this manner and that only about one-half the village will use the proposed sewers for several years. Taking these facts into consideration, the suggested method of disposing of the sewage is not in accordance with proper sanitary principles and would lead, in the future, to very objectionable conditions. It would be much easier to prevent the possible existence of these conditions now than it would be to correct them later.

The committee claims that the village cannot afford to raise the money to pay for following out the plans as approved by the State Board of

Health, in 1903. It was, therefore, suggested, in an informal manner by the chief engineer, that it would be possible to convey the sewage from that territory on the easterly side of the river, which it is desired to sewer immediately, through iron pipes across the Portage Street and the Broad Street bridges, and to discharge it into an interceptor to be built on the westerly side, and thus save building, at the present time, some 4,000 feet of intercepting sewer on the easterly side. By this arrangement all the territory which will be sewered within the next 5 or 10 years at least can be discharged at the outlet of the proposed westerly interceptor at a location approved by the Board.

It is estimated by the representative of the consulting engineers that the cost of the westerly interceptor from Portage Street to the proposed location of the outlet, a distance of some 3,000 feet, would be \$8,000 to \$10,000. This, then, is the amount which the village will save if allowed to discharge its sewage in the manner described above.

The city clerk has submitted a statement of the present financial condition of the village. From this statement, it appears that the tax levy for "General purposes" is 0.9 mill, while that for all purposes (sinking fund, etc.) is 5.0 mills. The total tax duplicate is approximately \$1,150,000, and the total bonded indebtedness is, at present, \$68,000. The total indebtedness is, therefore, 5.9 per cent. of the total valuation; but, as \$50,000 of this amount of indebtedness was incurred, for the purpose of establishing water-works, previous to the passage of the "Longworth act" it would seem that the indebtedness of the village is considerably below the legal limit of 8 per cent. and that the necessary amount for building sewerage, as far as present needs demand and yet discharge it at the outlet already approved, would be quite possible.

The Board on May 15, 1906, disapproved the proposed amendment to the sewerage plans for Cuyahoga Falls approved in August, 1903, calling for the discharge of sewage through five different outlets, two located at Portage Street, two at Broad Street and one at a point some 600 feet below Broad Street; and approved the suggested amendment to the above mentioned (approved) plans by which the sewage from that portion of the easterly side of the village which it was desired to sewer, might be conveyed through iron pipe, across the bridge at Portage and at Broad streets and discharged through the proposed westerly, or Front Street 18-inch interceptor, into the Cuyahoga River at the location and in a manner already approved.

On October 13, 1906, application was received from Mr. E. G. Bradbury, consulting engineer for Cuyahoga Falls, for approval of an amendment to plans drawn by Messrs. Snow and Barbour in 1903 and approved by the State Board of Health in August, of that year. The chief engineer made the following report:

The proposed amendment consists in locating the main sewer outlets just below the East Prospect Street bridge instead of at the points originally proposed. Prospect Street bridge is 1,300 feet above the location originally proposed for the easterly main sewer outlet and 600 or 700 feet above that proposed for the westerly main sewer outlet. By locating the outlets just below Prospect Street bridge, as proposed, the sewage would be discharged into the river 300 or 400 feet above a dam. This feature would be undesirable, but if the sewage were carried below this dam, there would be no objection, provided the original plans as approved by the Board in August, 1903, are carried out in other respects.

August 22, 1906, the Board approved this amendment to the original plans for the sewage (approved in 1903) with the outlet located at any desirable point below the lowest dam in the village and provided that the plans showing the exact location of the outlet sewer be filed with the State Board of Health.

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#### REPORT ON PROPOSED SEWAGE PURIFICATION FOR MAPLE-CLIFF, LAKEWOOD.

On August 1, 1906, plans were received from Charles W. Root, village engineer of Lakewood, for a sewage disposal plant for Maple-Cliff. One of the special assistant engineers held an informal conference with Mr. Root in reference to their design on August 13th, and the suggestions given at that time were adopted. On September 7, 1906, revised plans were submitted and the following report was made by the chief engineer:

The maximum number of people which it is expected will comprise the community of Maple-Cliff is estimated at 160. At present no houses have been built. Maple-Cliff borders directly on Lake Erie and it is important that the beach be protected from the effect of the discharge of unpurified sewage. It is estimated that the maximum average daily flow will be 16,000 gallons. There are a few catch basins connected with the sewers which will introduce storm water at times, and for this reason a storm water overflow has been provided.

The plans for sewage purification works consist of two circular septic tanks, each ten feet in diameter and six feet deep, holding together about 8,000 gallons, or twelve hours' flow, with the maximum quantity of sewage. The first tank is to be built so that it can be used by itself before the flow has become large enough to warrant the use of both tanks.

The effluent from the septic tank is retained in a dosing tank which discharges its contents automatically, when full, on the sprinkling filters. This dosing tank is designed to hold about one-half hour's flow.

The sprinkling filters are two in number, each fifteen feet in diameter and seven feet deep. The material is to consist of crushed stone from



one inch to two and one-half inches in size. The sewage is to be distributed over the sprinkling filters by nozzles, and one or both filters may be used. The filters are thoroughly underdrained.

The Board September 26, 1906, approved the plans for the sewage disposal plant for Maple-Cliff, as shown on drawings and described in a communication submitted by Mr. Charles W. Root, on September 7, 1906, provided:

1st. That the method of operation of the plant be at all times satisfactory to the State Board of Health; and,

2nd. That the plant be enlarged in a manner satisfactory to the State Board of Health when deemed necessary by said Board.

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### REPORT ON PROPOSED SEWER FOR LANCASTER.

The assistant engineer visited Lancaster July 31st, 1906, and while there had his attention called to the construction of a proposed sewer to discharge into Baldwin Run. He reported upon this as follows:

In the eastern portion of the city adjacent to Baldwin Run and on the property of Henry B. Peters, are about to be constructed eight new residences containing eight or ten rooms each. It is proposed to equip these residences with modern plumbing and it is desired to conduct the sewage directly into Baldwin Run by means of a vitrified sewer pipe. There will never be more than forty persons tributary to this sewer. The minimum flow of the stream is at present about 1,000,000 gallons per day and shows but slight evidence of pollution. All existing pollution is caused by slaughter houses, one of these being above the point proposed for discharging sewage and the other below. It is represented that this is the only feasible method of disposing of sewage from these houses in as much as the city sewer is at too high an elevation to be reached by them and cess-pools would be costly and unsatisfactory. It would seem advisable to permit the sewer to be constructed as proposed and to remain in place only until such time as a proper system of sanitary sewers for the entire city shall be installed.

The Board, September 22, 1906, approved this sewer, until such time as a proper system of sanitary sewers for the entire city of Lancaster shall be installed.

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### REPORT ON PROPOSED COMBINED SEWERS IN GORGAS STREET, LOUISVILLE.

It having come to the attention of the State Board of Health that the village of Louisville was intending to construct new sewerage, the assist-



ant engineer visited that place on July 11, 1906, and inspected the conditions involved.

The following report was made:

The village of Louisville is located in the eastern part of Stark County on Nimishillen Creek. The surrounding country is undulating to hilly. The village seems to be underlaid with a thick stratum of sand and gravel. The principal industries in the town are a foundry and a machine shop. The population at the present time is about 1,500, and the village is growing but slowly. The total assessed valuation is \$564,080, and the bonded indebtedness is \$9,000, or about 1.6 per cent. of the valuation. The tax rate is 2.9 cents. While the village is provided with a public water supply there are still a number of private wells. These are generally sunk into the sand and gravel and do not pierce any impervious stratum. The village is not equipped with a system of sewers, though there are a number of so-called storm water drains, which in several instances receive domestic wastes. Some of these drains, it was learned, had been put in place comparatively recently without the approval of the State Board of Health.

*Proposed Sewers.* It is now proposed to sewer Gorgas Street with two sewers, one on each side of the street and each 1,500 feet long. These sewers are to be twelve inches in diameter, constructed of ordinary field tile, and are to be laid three or four feet below the surface of the ground and with open joints. Besides three catch basins which will deliver to these sewers surface washings during storms, provision will be made for house connections which are to carry off sink, roof and cellar drainage, but no cess-pool or closet wastes. It was admitted, however, that it would be difficult to learn whether the property owner had connected the overflow of a cess-pool with such house connection. These sewers are to extend along Gorgas Street with a rather steep grade (not yet determined upon) to Nimishillen Creek.

It would seem, owing to the porosity of the soil, that a sewer constructed as above described would be a direct menace to the purity of the water in near-by wells. Furthermore, Nimishillen Creek has but a small discharge at this point, probably not over several million gallons per day, and the discharge of even a small amount of sewage into it would be likely to cause objectionable conditions.

As the village has a water-works and as the construction of some system of sewerage will become a necessity in the not distant future, it would seem advisable for the village to secure the services of an engineer for devising a system of well constructed sewers to cover the whole village, and which will bring all sewers to a common outlet where the sewage can be purified. Then as sewers are needed they can be constructed in accordance with this consistent plan, and thus, in time, a system of sewers be secured for the entire village, without the necessity of large outlays for reconstruction.

July 30, 1906, the Board disapproved the plans for proposed sewers in Gorgas Street, Louisville, unless the sewage be purified in a manner satisfactory to the State Board of Health.

The attention of the local officials was called to the importance of having made, by a competent engineer, comprehensive plans of domestic sewerage, with a sewage disposal plant, for the village. After having such a plan prepared, the sewers could be built as needed.

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### REPORT ON PROPOSED SEWERAGE AT LOWELLVILLE.

In reply to an inquiry, Mr. Robert Gray, village clerk, on January 31, 1906, notified the State Board of Health that Lowellville was about to construct a new sewer outlet into the Mahoning River. The assistant engineer visited Lowellville, February 1, 1906, to make the necessary investigation, and plans were submitted on March 12, 1906. The following report was made:

Lowellville is a village of about 1,200 population, in the western part of Mahoning County, on the Mahoning River, very near the Pennsylvania state line. The principal industry is the manufacture of iron and steel.

The Pittsburg and Lake Erie Railroad, in return for right of certain grade crossings granted by the village of Lowellville, agreed to build sewers for draining the village. These sewers are at first to carry storm water but ultimately, when a water supply is installed, it is intended to make house connections to them.

Three of these sewers have been built. Sixth Street sewer is a 30-inch vitrified pipe sewer and has its outfall in a substantial concrete abutment at the river's edge near the lower end of the village. At time of inspection, which was in very cold weather, there was no flow at the outlet.

McGill Street sewer is of brick and 4 feet in diameter, at the outlet, and is also protected by a substantial concrete abutment. This sewer discharges in the river near the upper end of the village and above the dam. Here also there was no flow at time of inspection.

Midway between the above two sewers is the Third Street sewer, which is built of 30-inch vitrified sewer pipe. It was intended to build the outfall of this sewer at the foot of Third Street which would cause the sewage and storm water to enter the river just above the dam belonging to Patrick Meehan, and furthermore the sewer would necessarily pass through a small parcel of land belonging to the same person. Mr. Meehan secured an injunction against the railroad company to prohibit it from building the sewer outlet at this point on the ground that at low water in the summer time, when the water does not overflow the dam, the sewage would cause a nuisance.

At the time of inspection the river was frozen over and water was passing over the dam, but it would seem highly probable that, under reverse conditions of weather, sewage entering at the point in question might cause considerable nuisance, since the bank and the dam form a stagnant pool in which sewage would undoubtedly accumulate. It should also be noted that the street overlooking the water front is the main business street so that a nuisance in the neighborhood would effect a large number of people.

At the present time there is an old private sewer discharging small quantities of domestic sewage into the river along side of the proposed location of the new outlet and it is claimed that even this causes a nuisance at times.

It would be easily possible by extending the length of the sewer somewhat to cause it to discharge into the river below the dam and thus avoid any difficulty.

April 10, 1906, the sewers recently constructed in McGill, Sixth and Third streets respectively, were approved by the Board provided the village council pass an ordinance forbidding the use of these sewers for household wastes; and that the sewer in Third Street be continued to a point below the dam near that street and there discharged.

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## REPORT ON PROPOSED SEWER FOR MARIETTA COUNTRY CLUB, NEAR MARIETTA.

January 27, 1906, application was made by Mr. Edward B. Follett, secretary of the Marietta Country Club, for the Board's approval of a new sewer to be constructed from the club house to the Muskingum River. Mr. Follett was requested to furnish further information, which he submitted a few days later, and the engineer of the Board made the following report:

The Marietta Country Club, an organization whose object is to provide pleasure and recreation for residents of Marietta, is located on the east bank of the Muskingum River about four miles and a half north of the city of Marietta. The club house is about 1,000 feet from the river. At the present time some difficulty is experienced in properly disposing of the sewage from the club house and it is therefore proposed to construct a sewer 4 inches to 6 inches in diameter from the house to the river.

The maximum population expected to use this sewer at any time is two hundred. From the nature of the club the sewer will be used only intermittently.

Considering the large volume of the flow in the Muskingum River, and also the fact that this river already receives a very large portion of the sewage of the city of Marietta just above its confluence with the Ohio

River, it would seem that the discharge of this small additional quantity of sewage, at irregular intervals, could not be objectionable provided the outlet be so constructed that no nuisance is created on the bank of the river. The water-works at Marietta are located on the Ohio River a mile above the entrance of the Muskingum River.

The Board, on February 3, 1906, approved this sewer, to discharge into the Muskingum River at a point about four miles above the city of Marietta, as described in the application to the State Board of Health January 27, 1906, provided the outlet be so constructed that the sewage would not create objectionable conditions by flowing over the bank before it reaches the stream.

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#### REPORT ON PROPOSED ADDITIONAL SEWAGE DISPOSAL PLANT FOR MASSILLON STATE HOSPITAL.

On June 5, 1906, Dr. H. C. Eyman, superintendent of the Massillon State Hospital, together with Mr. E. G. Bradbury, consulting engineer, submitted plans for a new additional sewage disposal plant for that institution. These plans bear the names of F. A. Barbour and E. G. Bradbury, consulting engineers.

On April 13, 1906, in anticipation of these plans being submitted, the chief engineer visited the Massillon State Hospital and the following report was made:

*Present Conditions.* The population now living at the institution is 1,600. At present the sewage is treated at a purification plant installed in 1898 and located at the foot of the hill just west of the institution buildings. This plant consists of four filter beds, each 100 feet square, making a total area of 1 acre. The filtering material consists of sand and gravel taken from a nearby bank. The average depth of the filtering material is  $4\frac{1}{2}$  feet. At certain times of the year, a portion of the flow of sewage from the institution is distributed over land and disposed of by irrigation. The plant, including the irrigation system, was designed to purify the sewage of only 1,000 people; and, on account of the greatly increased population, it is therefore overworked and very poor results are being obtained. The present site, although the best one available at the time of installation, is not now desirable.

*Proposed Work.* Instead of enlarging the present filter beds upon the site they now occupy, it is proposed to install the additional plant upon a site about 3,000 feet further west, upon land recently purchased by the institution. This site is near the Ohio Canal which receives the effluent from the present plant and will receive that from the proposed plant.

The topography of the proposed site is such as to permit easy connection with the existing sewer system, by gravity.

The proposed plans provide for 16 intermittent sand filters, each 93



feet square and having a total combined area of 3 acres. These filters are divided, by the distributing system, into four groups of four each.

The filtering material consists of the sandy soil now existing on the proposed site; so that the construction of the plant will consist principally of stripping off the top soil and leveling and underdraining the filter beds. Mechanical analyses of the material show it to have an effective size ranging from .25 to .45 m.m. and a uniformity co-efficient ranging from 1.75 to 6. It contains comparatively little dust or fine material.

Two lines of underdrains will be laid through each filter at a depth of 4 to 5 feet. These drains will be provided with sample holes for testing the effluent in the several beds. All embankments will be carefully constructed and sodded.

The sewage will be distributed on to the filtration area by means of a reinforced concrete dosing tank, holding 8,500 gallons, and equipped with four automatic flushing siphons to act in rotation. By means of diverting gates, each siphon can be made to discharge on four beds (one in each of the four groups) in rotation; thus 4 beds will receive the alternate discharge for a period of 24 hours, each one of the four receiving, during this time, about 55,000 gallons or 6 doses. These beds will then be allowed to rest for three days, while the other 12 are in use. The depth to which each filter will be flooded by each dose will be about 2 inches. The sewage will be distributed upon each filter by means of one wooden trough leading to a concrete slab in the center of the bed.

The estimated capacity of the proposed plant is 225,000 gallons per day. This is at the rate of 75,000 gallons per acre per day or, with the present population of 1,600 at the hospital, 533 persons to the acre. This rate is quite moderate. The capacity, therefore, of the proposed additional plant is great enough to treat all the sewage of the institution. By the introduction of a septic or sedimentation tank, the sand filters can be used at a much higher rate, if this should become necessary. As no great increase in the population of the institution will be possible until larger buildings are provided, the proposed sewage plant, as it is to be constructed, will be ample for the next few years or more. It is stated by the superintendent that the ultimate capacity of the institution is 2,000, or only 400 more than at present.

At a meeting of the State Board of Health, held June 19th, 1906, the proposed sewage purification plant for the Massillon State Hospital, described in the report and drawings submitted by Mr. E. G. Bradbury, consulting engineer, June 5, 1906, was approved, provided:

- 1st. That the plant be operated, at all times, in a manner satisfactory to the State Board of Health; and,

- 2d. That the capacity of the plant be increased in a manner satisfactory to the State Board of Health, whenever this is deemed necessary by said Board.



## REPORT ON PROPOSED SEWERAGE AND SEWAGE PURIFICATION FOR MEDINA.

At the meeting of the State Board of Health held on June 19th, 1906, Mr. E. G. Bradbury, consulting engineer for Medina, submitted plans for sewerage and sewage disposal for that village. In anticipation of these plans being submitted the chief engineer visited Medina on June 6th, 1906, and made an inspection of the territory involved. The following report was made:

The village of Medina, having a population of about 2,500, is the county seat of Medina County, and is located upon the upper portion of the watershed of the Rocky River very near to the divide which separates the Great Lakes from the Ohio River drainage. The topography of the village is such that the northerly portion and the southerly portion can most economically be drained by an independent system of sewers, each having a separate outlet.

At present there is no sewerage system in the village, although there are a number of private sewers and storm water drains which discharge into Champion Creek, which flows through the southerly part of the village and thence to the west branch of Rocky River. Champion Creek is very offensively polluted.

The present water supply of the village is derived from shale wells about 100 feet deep, and is inadequate and unsatisfactory both as regards quantity and quality. The water consumption at present is about 20,000 gallons per day. The installation of a new and suitable water supply is now being agitated, and it is expected that such a supply will be built in the near future.

The proposed sewerage is for domestic purposes only; the topography of the village making storm water sewers unnecessary. The sizes of the domestic sewers are so designed as to take care of the wastes from a population of 12,000 on the basis of the laterals flowing half full and the main sewers two-thirds full. The minimum velocity considered is two feet per second, except in one or two instances where it has been necessary to adopt a gradient giving a velocity of one and six-tenths feet per second. Each of the two disposal plants is designed to treat the sewage of 4,000 people, at 75 gallons of sewage per capita.

The sewer will be of standard construction of vitrified pipe with cement joints. Manholes will be located at all intersections, and changes of line or grade and flush tanks will be provided at the dead ends.

*Proposed Southerly Sewerage District.* The southerly district will comprise a territory lying along both sides of Champion Creek. The disposal plant for this district will be south of the creek at a point one mile southeast of town, upon a site well located as regards seclusion, topography and drainage. The intercepting sewer leading to this site will,

in a general way, parallel the creek, and will receive the sewage from the portion of the district south of the creek, through inverted siphons.

This intercepting sewer is 15 inches in diameter. It will discharge into a settling basin or sedimentation reservoir, located just across the creek from the proposed site for the filters. This reservoir will be 40 feet by 40 feet and 7 feet deep and will hold 150,000 gallons. On a basis of 300,000 gallons for daily flow of sewage, this will give 12 hours sedimentation. The reservoir will be divided into three sections in order to make it adjustable to the flow of sewage. A sludge bed, 10 feet square, consisting of gravel or cinders, will be provided to receive the sludge from the bottom of the tanks when cleaning is necessary.

The sewage will be drawn off from this reservoir at a point about 2 feet below the surface and will discharge into a 15-inch trunk sewer terminating in a flush tank, which will periodically discharge its contents through a 6-inch cast iron inverted siphon to the filtration area located on the opposite side of the creek adjacent to the Northern Ohio Railroad. The proposed filters will be of the so-called sprinkling type and will contain a total area of 12,800 feet divided into four portions, each 80 by 40 feet. The depth of filtering material will be 5 feet and will consist of crushed stone of sizes ranging from .5 to 2.5 inches, the coarser sizes being used in the lower part of the filter and the finer toward the upper part. This design is based on a rate of filtration of 1,000,000 gallons per acre per day.

The sewage will be distributed over these filters through 2-inch wrought iron pipes terminating in sprinkling nozzles so spaced that each will cover an area of about 170 square feet. The head operating the nozzles will vary from 5 to 10 feet.

The underdrain system will consist of 10-inch and 6-inch pipes closely spaced and so arranged as to permit of the filter being operated as a contact bed should this be desirable in severely cold weather.

Settling basins are shown on the plans to be built if necessary for the purpose of allowing sedimentation of the filter effluent. Their construction, however, will probably not be necessary; at least in the immediate future.

*Northerly Sewerage District.* The northerly sewerage district will contain approximately the same total length of sewers and will serve about the same population as the southerly district. The proposed disposal plant for this northerly district has, therefore, been made of the same size as that for the southerly district. Practically the only difference between the two plants is that the northerly plant will be operated continuously instead of intermittently.

The effluent from this plant will pass into a small run which flows about two miles through an uninhabited district and then discharges into the west branch of the Rocky River.

*General Discussion.* As it has been found impracticable to obtain

sand or other fine material suitable for intermittent filtration in the vicinity of Medina, it seems quite reasonable to plan for the installation of sprinkling filters as proposed, although it is not expected that the latter will give an effluent as well purified as that from sand filters. Considering the proposed low rates of operation of the proposed plants, however, and the fact that neither the small streams which will receive the effluent nor the Rocky River itself, is used for a public water supply below Medina, it would seem that no objectionable conditions could be caused by carrying out the proposed plans. The comparatively low rates at which the sprinkling filters will be operated will undoubtedly produce an effluent which will be unobjectionable so far as appearance or odor is concerned.

*Present Installation.* The consulting engineer desires the approval of the State Board of Health of the project of building at present only about half of the tank capacity and one-fourth of the proposed filter area. It is also desired to omit the construction of the settling tanks until such time as these may be considered necessary by the State Board. The reason given for desiring to construct only a portion of the plant at present is the fact that it will be several years before any considerable amount of sewage is produced by the inhabitants of Medina.

July 12, 1906, the Board approved these plans submitted by Mr. E. G. Bradbury June 19, 1906, provided:

1st. That both the northerly and southerly plants be enlarged in a manner satisfactory to the State Board of Health whenever this is necessary in the opinion of said Board; and,

2nd. That the operation of the sewage disposal plants be at all times subject to the approval of the State Board of Health.

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## REPORT ON PROPOSED SEWER AT MINERAL CITY.

On July 7, 1906, a letter was received from Mr. C. Edward Holden, mayor of Mineral City, enclosing plans for a proposed sewer to be used for domestic purposes.

The assistant engineer visited Mineral City July 16, 1906, and investigated the proposed plans.

The following report was made:

The village of Mineral City is located in the northwestern part of Tuscarawas County, and drains into Huff Run, a small tributary of Nimishillen Creek. The surrounding country is hilly and is rich in deposits of coal and fire clay. The present population is about 1,400, most of whom have farming interests or are engaged in the pottery works which is the manufacturing interest which the village has grown about. The village has a public water supply which is in general use. There are

a few poorly constructed sewers and ditches built partly by private parties and partly by the village. These discharge into a very small creek in the western part of the village and into Huff Run at the southern end of High Street.

*Proposed Sewers.* It is now proposed to construct new sewers discharging as before into the small creek in the western part of the village and into Huff Run. The location, size and details of these sewers have not yet been determined upon, but it is supposed they will be constructed of vitrified sewer pipe and be on the combined system. It is likely that a large proportion of the residences and business buildings, as well as a large school house, will be tributary.

A small amount of domestic sewage at present discharged into Huff Run causes quite objectionable conditions in that stream during the summer months both in the form of black deposits and bad odors. The discharge of sewage in the small ditch in the western part of the village should be out of the question since it contains during periods of dry weather but a trickling flow, and furthermore, spreads out into marshes at a point below the proposed introduction of the sewage. The small amount of waste now entering this creek causes objectionable conditions at times. There are considerable deposits of sand and fine gravel in the neighborhood that can undoubtedly be successfully used for intermittent filtration. Material for sprinkling filters or contact beds is not readily available.

It should be noted that Mineral City is at present very heavily in debt and cannot legally increase its bond issue. Should it be impossible to build new sewers and a sewage disposal plant also with money obtained from assessments on abutting property owners, it would be advisable to continue the use of vaults and cesspools, but under more strict regulations as to their proper construction and maintenance.

July 30, 1906, the Board disapproved the plans for a proposed sewer in High Street, Mineral City, as shown on sketch submitted by C. Edward Holden, July 9, 1906, unless the sewage be purified in a manner satisfactory of the State Board of Health before it is discharged into the creek.

The authorities were advised that in case the village did not build the proposed sewer it was important that proper rules and regulations regarding the cleaning of vaults and cess-pools be adopted and enforced.

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#### REPORT ON PROPOSED SEWERAGE FOR THE WEST VERNON LAND COMPANY NEAR MOUNT VERNON.

On July 27th, 1906, Mr. R. M. Douglass, of Pittsburg, civil engineer for The West Vernon Land Company, made application for ap-



proval of a proposed sewer outlet. On July 30th, 1906, plans were submitted showing the proposed work.

The following report was made by the chief engineer :

West Vernon comprises an area of private property covering about 150 acres, located south of the Kokosing River, and adjacent to the southwesterly corner of the city of Mt. Vernon.

As yet, the property is comparatively undeveloped, but it is expected that about 140 houses will be completed in the near future, which will accommodate 700 to 800 people, while the plans ultimately provide for houses for 2,000 people. It is also intended to annex this property to the corporation of Mt. Vernon in the near future.

It is proposed to provide adequate drainage for the entire property, which will mean  $1\frac{1}{2}$  to 2 miles of sewers. These will be used for all purposes. The main sewer is to be 15 inches in diameter, and it is proposed to discharge it into the Kokosing River at a point about 2,000 feet west of Norton Street, Mt. Vernon.

In 1903 the city of Mt. Vernon made application for approval of a sewer for District No. 3 in the westerly portion of the city to discharge into the river near the B. & O. Railroad bridge. After an investigation into the conditions of the Kokosing River and the amount of sewage which it was then receiving, the Board disapproved the proposed sewer for District No. 3, and the following notice was sent to the city officials :

"The Board is convinced in the first place that the amount of sewage you are proposing to convey to the river from your city, will be too great a burden for the stream to carry, and will cause its pollution. The Board has therefore voted to disapprove plans unless some satisfactory provision is made for purifying the sewage at this time. The Board strongly urges also that your plans should be revised so as to provide a strictly sanitary sewer for District No. 3, with such storm water sewers as may be actually necessary to carry off the surface water."

As the sewers now proposed for West Vernon would discharge approximately half a mile above the location for the proposed city outlet for District No. 3 disapproved for the reasons above stated three years ago, it would seem that the West Vernon outlet should also be disapproved.

August 1st, 1906, the Board disapproved the proposed sewer outlet as shown upon plans submitted by Mr. R. M. Douglass, of Pittsburg, engineer for The West Vernon Land Company, on July 30th, 1906, unless the sewage discharged through this outlet be purified in a manner satisfactory to the State Board of Health.



## REPORT ON PROPOSED ADDITIONAL SEWERAGE FOR NEW BREMEN.

On April 21, 1906, Dr. E. M. Phelps, health officer, and Mr. A. M. Steinebray, village clerk, made application for approval of a new sewer for New Bremen and on April 24, 1906, the assistant engineer visited that place and made necessary inspection.

The following report was made:

The village of New Bremen is in the southwestern corner of Auglaize County, upon the extreme upper watershed of St. Marys River, a tributary to the Maumee River and on the Miami Canal. It has a population of about 2,000. The country round about is generally level, though there are a few low hills and shallow ravines here and there. The soil is generally clayey, though a poor grade of gravel is found in several places. The clay stratum seems to extend to a depth of about 60 feet under which is found a very pure white limestone. The village, including recent additions, has an area of approximately one square mile; it is provided with a public water supply from deep wells and a few sewers, but there are as yet no paved streets. Preparations are being made at the present time to pave Monroe Street, which is the principal business street.

*Existing Sewers.* There are at present four lines of existing sewers built some four or five years ago, and intended for storm sewers. It was stated that plans for these sewers had been submitted to and approved by the State Board of Health, but no record of such action could be found in the office. Before these sewers had been in existence very long, a number of house connections were made to them, thus converting them into combined sewers. The principal one of the existing sewers, known as the "Creek-sewer," extends along the bottom of a ditch which takes the overflow from the Miami Canal, at a point about one mile south of the village. Just north of the village this sewer has an outlet into the same ditch. The next most important sewer is that on Walnut Street which starts at South Street and extends, as shown on the map, to a point north of town and enters the ditch which receives the discharge from the "Creek-sewer" above mentioned. There are two smaller sewers, one in the northern part of town, known as Heinfeld's sewer, which discharges at the same point as the "Creek-sewer;" the other, known as Herman Street sewer, which is tributary to the "Creek-sewer" and enters it at a point near the center of the village. The connections made to these existing sewers, for domestic purposes, were made by private parties and without any formal permission from the village authorities, so that their number and location is not known. During the past year or two, there has been considerable complaint from bad odors arising through catch basins from these sewers. These odors are due, as inspection showed, to accumulation in the pipes and in the bottoms of manholes which were not properly constructed for

carrying domestic sewage. This matter, however, could probably be remedied by reconstructing the catch basins, equipping them with traps and filling up the bottoms of the manholes with concrete to a level with the centers of the sewers and molding a channel on a level with the inverts so that there would be no chance for slack-water during ordinary dry weather flow. In addition to this it might be necessary occasionally to flush the sewers with a fire hose.

No measurements have ever been made on the discharge of the existing sewers, but, from appearances on date of examination, it can hardly exceed 40,000 or 50,000 gallons per 24 hours. The ditch in which the sewage is discharged is at most times perfectly dry and below the sewer outlets, the only flow therein is that received from the sewers. The ditch has not been kept in very good condition and has filled up perhaps a foot on the bottom, thus causing the sewage to back up and stand in pools. There is also a thick algal growth in the bottom, which prevents a rapid flow of the water. The appearance of the liquid itself was not particularly bad and no odors could be noticed even at so short a distance as 25 or 30 feet from the ditch.

Complaint has been made by persons owning pastures along the ditch below the sewer outlets, and it is claimed that cattle grazing in these pastures have been made sick by drinking the water. They wish to have all sewage taken out of the ditch, so that the cattle may use it for drinking purposes without danger, but since the sewage forms the only flow in the ditch during a large part of the time it is not quite evident how the owners could be benefited.

*Proposed New Sewers.* It is now proposed by the village to build two new combined sewers, one running the length of Washington Street, beginning at South Street and discharging into the ditch near the outlet of the "Creek-sewer." The other to extend along Main Street, beginning at Monroe Street and entering the Heinfield sewer which discharges, as before noted, at the same point as the "Creek-sewer." These new sewers are to be provided with trapped catch-basins and provision for house connections is to be made in front of each lot. It could not be determined how many connections would be made to these sewers during the first year after their installation, but it is presumed that nearly all property owners along the streets in which they are laid will take advantage of them. In estimating the amount of sewage that will be discharged into the ditch, within the next few years, it would be safe to assume that 1,000 persons will be tributary to the sewer system. With this amount of sewage the ditch would undoubtedly become a great nuisance even though it were cleaned out and re-sectioned. It would be practically impossible to decrease the grade of the sewers or raise the elevation of their inverts sufficiently to secure a gravity flow to a purification plant. The nuisance of discharging sewage directly into the dry ditch could probably be averted, however, by admitting water thereto from the Miami Canal above

the sewer outlet. Estimating 3 cubic feet of water per second necessary to dilute the sewage from 1,000 inhabitants, something over 3,000,000 gallons of water per day would need to be taken from the canal. This amount, as learned on inquiry at the office of the State Board of Public Works, could be obtained free, or at most at a normal cost. This method of caring for the sewage was suggested to the consulting engineer of the village and met with his approval and he, in turn, will lay the matter before the village council.

*Summary.* Briefly, the conditions in the sewerage system which require remedy are untrapped catch basins and improperly constructed man-holes in the existing sewers, and the discharge of sewage, without dilution, from the existing sewers into an open ditch just north of the village, and the discharge of sewage from the proposed sewers into the same ditch.

May 8, 1906, the State Board of Health approved this proposed sewer at New Bremen, to discharge into a ditch leading ultimately into the St. Marys River, as shown upon plans submitted April 21st, 1906, provided:

1st. That a continuous stream of 3,000,000 gallons of water per day be diverted from the Miami Canal (after making the necessary arrangements with the State Board of Public Works) and passed through the ditch, in order to dilute the sewage from the proposed sewer as well as from the present sewers.

2nd. That sewage purification works, satisfactory to the State Board of Health, be installed and operated when this method of disposal by dilution becomes, in the opinion of said Board, inadequate.

3rd. That all catch-basins connected with the present and proposed sewers be trapped and that these catch-basins, as well as the sewers themselves, be flushed at regular intervals in order to prevent the accumulation of foul deposits in the sewers.

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## REPORT ON PROPOSED GENERAL SYSTEM OF SEWERAGE AND SEWAGE DISPOSAL FOR NORWALK.

March 30, 1906, Mr. E. G. Bradbury, consulting engineer for the city of Norwalk, submitted plans and general description for a complete domestic and storm water sewerage system, and also for a sewage disposal plant, for that city.

The plans were referred to the chief engineer of the Board who has visited Norwalk several times during the year past in reference to proposed sewerage and was familiar with the topographical and sanitary conditions of the city. The following report was made:

Norwalk having a population of about 8,000, is located in Huron County upon the watershed of the Huron River. The northerly portion

of the city drains naturally into two or three small intermittent streams or ditches, which unite at a point about one mile north of the corporation and then, after flowing two miles further in a northerly direction, discharge into the Huron River just above the village of Milan.

The southerly portion of the city drains naturally either into Norwalk Creek, which enters the east fork of the Huron River about a mile southwest of the corporation, or into ditches leading directly to the east fork. Norwalk Creek has a watershed of only about 10 square miles. It is impounded above the city, for use as a public water supply. The flow therefore, through and below the city is at times reduced to practically nothing. The dry weather flow of the east fork, as well as the main stream of the Huron River, judging from accurate measurement of the discharge of the Black River, which has a similar watershed, is not sufficient to satisfactorily dilute the sewage of the city of Norwalk.

There are at present thirteen or more miles of sewers in Norwalk. All of these sewers are built upon the combined plan; being used for domestic sewage, storm water and also, in some cases for land drainage. The sewers have been constructed in an unsystematic way and discharge into the nearest ditch or water course. Little, if any, attention has been given to the sanitary features or to the ultimate disposal of the sewage.

*Water Consumption.* The water consumption in Norwalk is abnormally high, over 1,500,000 gallons being used each day, which represents a daily per capita consumption of about 200 gallons. The sewage, therefore, principally on this account is very dilute. This has been well shown by gaugings and analysis of the present sewage. Comparison of the results of these gaugings and the probable amount of water used by the people connected with the sewers shows that the sewage contains about 25 per cent. ground water.

*Past Actions of the State Board of Health.* In October 1902, the Board approved the plans for a sewer in the westerly part of the city, to drain an area bounded by Main Street, Pleasant Street, the W. and L. E. R. R. and the westerly corporation line, for a temporary expedient only.

This sewer is now built and receives the sewage from 300 to 400 men, employed at the railroad shops, and also the waste from the pickle factory.

In March, 1905, the Board approved plans for a proposed sewer in the so-called Milan Street district, and also plans for a proposed relief sewer in Elm Street, provided that these sewers be used for surface and ground water only, and that "the council first pass and file with the State Board of Health an ordinance forbidding the tapping of these sewers, or any sewers tributary thereto, for the purpose of admitting household wastes of any kind; such ordinance need not apply to house connections already made with the present sewers \* \* \* but such an ordinance must forbid the future use of present sewers for household drainage."

A few months later, in July, 1905, after urgent appeal on the part of



city officials, the Board modified its action of March 1905 by approving the sewers in the Milan Street district, for use as domestic sewers for a period of one year from date of completion, upon the conditions that council pass an ordinance for a general plan of sewerage and sewage disposal for the entire city, subject to the approval of the State Board of Health.

The Board also approved at this time the proposed overflow sewer in east and west Elm Street.

Acting upon the above action of the State Board of Health the city retained a sanitary engineer, who thoroughly investigated the project of sewerage and sewage disposal for this city, and who submitted a report to the State Board of Health at its meeting on January 26, 1906, with the request that the city be allowed to discharge sewage into the East Branch of the Huron River without purification. This project was disapproved.

*Proposed Plans.* Accordingly the proposed plans, now submitted to the Board for action, were drawn up.

The city has been divided into sewer districts; District No. 1 comprises the area north of Washington Street and west of Milan; No. 2 includes the Milan Street sewer and its branches as far south as Main Street, and east of the W. and L. E. R. R.; No. 3 is the east end of town the westerly boundary being the Huron Branch of the W. and L. E. R. R. No. 4 takes in the territory west of Newton Street; No. 5 the business district and a residence area, lying between Cemetery, Newton, Washington and Foster streets; No. 6 comprises the Benedict and Norwood Avenue system; and No. 7 the Woodlawn Avenue territory. The sizes of the storm and combined sewers are as large as can be considered economical, though backwater at times of storms of unusual intensity may be possible.

The sanitary sewers are, except in the largest sizes, designed to flow half full with a per capita use of 100 gallons of water daily for a population of 35,000. The 24-inch main is designed to flow 2-3 full under the same conditions.

The entire southerly part of the city, as mentioned above, is separated from the northerly part by the Norwalk Creek. This southerly part is already extensively sewered and the problem of using these present sewers has been a difficult one to solve. It has been found, however, that by the readjustment of certain sewer grades in this district and by the use of an inverted siphon, this district can be connected with the northerly section and drained with it to one disposal plant.

The general plan adopted provides for a separate system in District No. 6, the present sewers being continued in use for domestic purposes and the surface water cut off by a new system of storm drains. The latter will discharge in Norwalk Creek, while the flow of the former is carried by means of an inverted siphon to Seminary Street where it enters District No. 5 and flows down Hester Street.



The storm system of District No. 6 will be in three sections, having one outlet in Chestnut Street and two in Elm Street.

In all other districts, except No. 3, it is proposed to retain the present combined system, relieving the conduits where overtaxed, usually by new combined sewers, and diverting the excessive flow in times of storm to the natural water courses by means of regulating valves.

In District No. 7 a regulator will allow the dry weather flow in Woodlawn Avenue to pass through Pine Street to Corwin; the latter sewer, being designed as a future relief for upper Woodlawn Avenue, must be provided with a second regulator by means of which the storm flow will be diverted through Madison Avenue back to Woodlawn Avenue and Norwalk Creek. The sanitary flow will pass on through Corwin Street to Main and down Chatham Street into District No. 2.

District No. 4 is now sewered through Jefferson Street and an open gutter in Pleasant Street. The combined system will be continued in Pleasant Street to Washington, and in the section south of Jefferson Street a regulator will be provided at West Street allowing the dry weather flow to pass down a sanitary sewer in West and Washington streets to a junction with Pleasant Street.

It is recommended that the sanitary fixtures of the W. and L. E. R. R. shops and pickle factory, be connected with the city sewers, and that the boiler wash water and saline pickle wastes be permitted to continue to their present outlet. The heavy charge of suspended solids and evident antiseptic quality of the liquids, renders it undesirable at the disposal plant and there appears to be no reason for anticipating pollution of the river from it, provided that the above change is carried out.

In District No. 5, there is but one natural outlet and the expense of a new storm system would be great. Therefore relief sewers have been designed to intercept excess storm water.

The storm water from District No. 5 will be discharged at the present outlet, north of Washington Street, while the dry weather flow will be carried in a 24-inch line through District No. 1.

The only portions of the city which are not provided with an outlet by the proposed system, are a small area adjacent to Norwalk Creek (principally occupied by lumber and coal yards) and the east end of Gallup Avenue with a small area of entirely undeveloped territory.

The sewage disposal plant will be located at a point about one-half mile north of the corporation line in the valley of one of the two small runs or ditches which receives present drainage from the northerly part of the city. There are a number of sites near these runs which could be used for high rate filters, but none large enough for a sand filtration plant. Therefore, it will be necessary to go some distance further from the city through the valley of Huron River and this would mean great expense. Furthermore there are no deposits of suitable sand or gravel, for use in such plant, within a reasonable distance.

The method proposed, therefore, is contact treatment in filters of coke, cinders or crushed limestone preceded by sedimentation in a reinforced concrete tank or reservoir, with provision for treating the sludge deposited in this reservoir upon a sludge bed of the same material, with a top coating of finer material. The plant is designed to purify, to a point beyond the putrescible stage, a flow of about 1,000,000 gallons per day of sewage. With proper restrictions as to water waste in the city, it is probable this plant will be sufficient for a number of years.

The reservoir is of 1,000,000 gallons capacity, divided into four units, the dimensions of each unit being  $89\frac{1}{2}$  feet by 45 feet by 8 or 9 feet deep. A total of 24 hours capacity is thus provided with a flow of 1,000,000 gallons per day. One or more units can be used as desired. After passing through a 1-inch screen, the sewage enters the reservoir through a slotted pipe, extending across the upper end, at an elevation of 4 feet below the surface and with openings every 2 feet. The sewage is drawn off in a similar manner, at the same elevation, at the lower end of the reservoir. The flow of this effluent will be regulated and kept constant by an automatic device. This will cause the surface of the liquid in the reservoir (with a daily flow of 1,000,000 gallons) to fluctuate not more than  $1\frac{1}{2}$  feet. A 15-inch sludge outlet is provided at the bottom of the lower end of each unit.

The effluent from the reservoir is aerated by dropping a distance of 7 feet and then passing through a riffled concrete sluice-way on its way to the contact filters.

The contact filters are five in number, four being 5 feet deep and the fifth 4 feet deep. The area of the deeper beds is 1.5 acre each and the shallower one is proportionately larger, so that each one of the five beds has the same capacity. The outside embankments will be of earth and the dividing walls will be of concrete. The size of the particles of coke, cinders or crushed limestone, which it is intended to use, will be 1-8 inch to 3-4 inch in diameter.

The operation of the beds will be automatically controlled, although no specific device for doing this has yet been presented for approval, and the sewage will be thoroughly distributed over the surface of the filtering material by means of 12-inch pipe covered with a thin layer of the same material in order to keep the sewage from appearing on the surface and also to prevent growth of weeds.

The underdrainage system will be of open joint sewer pipe, so designed as to permit the emptying of a bed in one hour, if desired.

With a flow of sewage of 1,000,000 gallons, the beds would be operated at the rate of about two contacts per day. This would be a reasonable rate. With the present abnormally large flow, however, when all the sewage is conveyed to the disposal works, the contact beds will doubtless have to be operated at too great a rate.

General provision is shown in the plans for building a second set of

contact beds, similar to the ones now proposed, whenever it is necessary, and this second installation will have to be built unless the flow of sewage is reduced by proper water waste restrictions.

The Board, on April 7th, 1906, approved these plans for a general system of domestic and storm sewers and sewage disposal, submitted March 30th, 1906, provided:

1. That the sewage disposal plant be constructed before any of the proposed sewers are placed in use.

2. That the sewage disposal plant be enlarged, in a manner satisfactory to the State Board of Health, if, after the plant has been in operation for a period of six months, the dry weather flow of sewage entering the new sewers is found to exceed 1,000,000 gallons per day.

3. That the sewage from that portion of Norwalk which, by reason of its low elevation, can not be drained into the proposed system of sewers, be treated at auxiliary disposal works of a design satisfactory to the State Board of Health, or be pumped to the proposed main disposal works whenever purification of the sewage from such district is deemed necessary by said Board.

4. That the adjustment of the storm water overflows be subject at all times to the approval of the State Board of Health; and,

5. That the automatic controlling devices for the contact beds be approved by the State Board of Health before being installed.

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## REPORT ON PROPOSED NEW SEWAGE DISPOSAL PLANT FOR OBERLIN.

Application was received from the mayor of Oberlin on August 8, 1906, for the Board's approval of a site for a new sewage disposal plant, and also for approval of plan of continuing the present method of purification. Oberlin was visited by one of the special assistant engineers, on April 9, 1906, and the condition relating to the new project, as well as those relating to the present works, were thoroughly examined. After a careful study of the conditions the following report was made by the chief engineer:

*Present Conditions.* Oberlin has a population of over 5,000. The public water supply was installed in 1887, and is now used by some 70 per cent. of the population. The first sewers were laid in 1892 and purification works were built two years later. These works were the second in the state of Ohio.

The original method adopted for sewage purification was intermittent filtration and broad irrigation. The works are located upon a 20-acre tract of land, near the Elyria pike, one and one-half miles east of

the built-up portion of the village. Three and one-half acres of the area were divided into twelve beds, and underdrained for intermittent filtration; while one and three-fourths acres have been underdrained for broad irrigation.

These works were operated with a fair degree of success until three or four years ago, at which time the amount of sewage became too great for the works. The result was that the filter beds, being of clayey material, became saturated and sewage overflowed the embankments surrounding them and passed into the creek.

In order to effect as much purification as possible in the sewage, chemicals have been used during the summer time for the last two or three years; and the filter beds have been transformed into precipitation basins. Since the village has installed its water purification plant the sewage has been treated with lime and copperas. The copperas is introduced into one of the lateral sewers at the water plant and the lime is fed into the main sewer a short distance above the sewage works.

This treatment effects considerable clarification of the sewage, but as shown by the recent inspection and by the analytical data in the special assistant engineer's report, the effluent is of a putrescible nature and is not suitable to discharge into the creek.

*Proposed Plans.* About half a mile farther down the creek from the present plant the city owns a farm, upon which it is proposed to construct new sewage works, to be operated on the same system as that used at the present plant. The location of this land is admirable for sewage disposal purposes, but our investigations have shown that the present method, which is simply a form of chemical precipitation, would not be satisfactory; unless this were used simply as a preparatory process and the sewage subsequently filtered before being discharged into the creek.

On September 14, 1906, the Board approved the tract of land owned by the village and located along Plum Creek about three miles east of the village as a site for sewage purification works; but the method proposed for operating the sewage purification works was disapproved unless the sewage be further purified by filtration, in a manner satisfactory to the State Board of Health, and unless the purification plant be operated during the entire year.

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## REPORT ON PROPOSED SEWERAGE AND SEWAGE PURIFICATION FOR OXFORD.

On December 14, 1906, plans for complete sewerage together with sewage purification works for Oxford were submitted by Mr. Alexander Potter of New York, consulting engineer for the village of Oxford.



The chief engineer in company with the consulting engineer made on the same day a thorough inspection of the territory involved and submitted the following report:

Oxford is a village of about 2,500 inhabitants, located in Butler County on the watershed of Four Mile Creek, a tributary of the Great Miami River. The village is an educational center, there being located there the following colleges: Miami University, Oxford College and Western College for Women.

The village is provided with a public water supply which is quite generally used. There is no sewerage, except for the colleges. The sewage from two of the colleges, Miami University and Western College, is disposed of in an objectionable manner, and it is important that conditions at these places be remedied.

The sewerage system as proposed by the consulting engineer provides sewerage for practically the entire corporation, there being only about half a dozen houses which are too low to enter it. The plans show some eleven miles of sewers, ranking in size from 6 to 15 inches, which is the size of the main trunk sewer. The sewers are planned in accordance with the most modern principles as regards ventilation and self-cleansing grades. No surface water is to be admitted to the sewers. As is usual with villages of this character, the system will be built gradually, and it is not expected that more than a few hundred people together, probably, with the university will use the system for some years.

The site chosen for sewage purification is on land belonging to Western College at the junction of Bull Creek and Four Mile Creek. Four or five acres at least will be purchased at this point. The site is very favorably located for the purpose, there being no house within nearly half a mile, and the works will be entirely hidden from view from any highway. There is abundant sand and gravel in the creek beds near at hand for use for filtering material and also for use in concrete work. The cost of constructing the plant will, therefore, be reduced to a minimum.

The plans, therefore, for present installation consist of a septic tank and contact beds, but in view of the fact that there will be only a small quantity of sewage for the plant to treat for some years—as discussed above—it is proposed to construct only half of the system at present and to use the filters so constructed on the intermittent filtration plan instead of on the contact plan, thus saving the expense of installation and care of controlling apparatus.

The plans, therefore, for present installing consist of a septic tank 38x20x9 feet, holding about 50,000 gallons, and two filter beds each 11x23 and 3 feet deep, containing filtering material to be approved by the State Board of Health. The sewage will be distributed on to the filters by means of an automatic siphon and dosing tank. There is



also to be provided a sludge pit 30 feet square into which the septic tank may be drained when necessary, thus eliminating the necessity for discharging sludge into the creek.

When the amount of sewage warrants it, the works may be extended and continued in operation on the intermittent plan or changed over to contact beds by changing the character of the top filtering material and installing controlling apparatus in chambers provided for that purpose.

The plans for the sewerage system and purification works will provide an efficient system for the village, and that portion proposed for immediate installation will be adequate for needs in the near future.

December 21, 1906, the Board approved the plans for sewerage and sewage purification for the village of Oxford, as shown on drawings submitted by Mr. Alexander Potter, consulting engineer, on December 14, 1906, said plans consisting of—(a) a complete sewerage system for the village to be built gradually, as needed, and (b) sewage purification works located on land near the junction of Bull Creek and Four Mile Creek, comprising for present installation septic tank, dosing tank and intermittent filters (cross-hatched in red on plans), the filtering material in which is to be submitted to the State Board of Health before being placed; provided that the operation of the purification plant be at all times subject to the approval of the State Board of Health, and that the plant be enlarged when deemed necessary by said Board.

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#### REPORT ON PROPOSED SEWAGE DISPOSAL FOR THE COUNTRY CLUB AT PLEASANT RIDGE, NEAR CINCINNATI.

On October 27, 1906, a communication was received from Mr. Charles Kuhn, the chairman of the Country Club at Pleasant Ridge, asking approval of a certain method of sewage disposal for the club house. The matter was referred to the member of the Board residing in Cincinnati, who on November 16, made an inspection of the club grounds, investigated the proposed plans and submitted the following report:

The grounds cover 140 acres and the club house will be at the northeast (highest) corner. The membership of the club is limited to two hundred. It is thought that the daily average attendance, except for Saturday and Sunday, will be about fifteen. On the two days mentioned it will be about fifty.

In addition to a kitchen, there will be eight water closets and five shower baths. About 175 feet from the house is a ravine running through the grounds, about 2,000 feet, to the property line, thence to a branch

of Mill Creek. At the point nearest to the house the stream, a small one, which in summer is entirely dry, is about 40 feet below the level of the house. The soil is clay underlaid with limestone.

It is proposed, if it meets with the approval of the State Board of Health, to make two vaults, 7 feet in diameter and 8 feet deep, or larger if deemed desirable. The first vault will be about 150 feet from the house and about 30 feet below its level, the second 8 or 10 feet lower.

It is thought that solid matter will be deposited in the first vault and the liquid portion flow to the second vault. Leading from the second vault is to be a system of "bleeders" of porous tile surrounded with gravel, coke or broken stone and covered with earth. The total length of these tile will be about 150 feet and they will be laid on a flat grade.

The wastes from the kitchen will flow into a grease trap, thence into the second vault. The roof water and water from the shower baths will be discharged directly into the stream.

It is not proposed to have any filtration except such as will be had through the material surrounding the "bleeders." This is the plan suggested for our approval.

The Board, November 30, 1906, approved the proposed method for disposing of the sewage of the Country Club at Pleasant Ridge; said method to consist in discharging the sewage into a vault or tank 7 feet in diameter and 8 feet deep, from which it would overflow into a second tank of somewhat smaller dimensions, from the bottom of which it would pass into a stream of three lines of porous tile surrounded by gravel, coke and broken stone parallel to the stream, upon the conditions:

1. That both tanks or vaults be made water tight.
2. That an automatic siphon be placed in the second tank, in order to discharge the sewage intermittently into the system of tile drains.
3. That the tile be at least 6 inches in diameter and be laid at least 18 inches below the surface of the ground.
4. That the lines be at least 15 feet apart.
5. That if necessary to keep down the ground water level, the territory covered by this tile be thoroughly underdrained, and,
6. That the joints of the tile be cemented wherever the tile passes over such underdrains.

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## REPORT ON SEWERAGE FOR PLYMOUTH.

On January 26, 1906, application was made for approval of certain sewers in Plymouth. These sewers had been constructed for some years but were never approved by the State Board of Health, and the health officer had been endeavoring to prevent connections with these sewers but without much success. He therefore desired to know definitely whether

or not these sewers met the approval of the State Board of Health. In connection with sewerage for Plymouth the chief engineer visited that place in June 1905, and on April 24, 1906, the following report was made:

Plymouth is a village of 1300 inhabitants, located partly in Richland County and partly in Huron County, the county line extending in an easterly and westerly direction through the main street of the village. The upper portion of the Huron River passes along the edge of the corporation. It is at this point a very small stream and has an estimated dry weather flow of only 350,000 gallons.

In September, 1902, it came to the attention of the State Board of Health that a sewer was about to be constructed at Plymouth to discharge into the Huron River within a short distance of the center of the village and less than a half mile above an ice pond from which the principal ice supply of the village is derived. The ice is sold presumably for "cooling purposes" only, but may be used for all purposes. The following letter was sent by the State Board of Health to the mayor and council:

COLUMBUS, OHIO, September 22, 1902.

*To the Mayor and Council, Plymouth, Ohio.*

DEAR SIRS:—It is reported to me that you are about to construct a sewer with outlet into the river, and I beg to call your attention to the law providing that "No city, village, corporation, or person shall introduce a public water supply or system of sewerage, or change or extend any public water supply or outlet of any system of sewerage now in use, unless the proposed source of such water supply or outlet of such sewerage system shall have been submitted to and received the approval of the State Board of Health. (O. L. vol. 90, p. 94).

When you have adopted plans for this sewer, kindly notify me and a committee of this Board will make the necessary investigation and report.

Yours truly,

C. O. PROBST, *Secretary.*"

The following reply was received from the village clerk:

"PLYMOUTH, OHIO, Sept. 24th, 1902,

C. O. PROBST, *Sec'y.*,

*State Board of Health.*

DEAR SIR:—Your letter of the 22nd instant, addressed to the mayor and council of the village of Plymouth, O., was read at a meeting of the village council last evening (23rd) and I was instructed to write to you in regard to the matter in question.

The facts are that the village is not constructing a sewer of any kind, neither have they under consideration the construction of any sewer or system of sewerage in the near future, but, I presume the matter that has been brought to your attention is the improvement of a ditch that passes through the Richland County side of the village and is now being made by the Richland County commissioners. This ditch, a part of which has been open, has long been a menace to the health of the

inhabitants living along the line of it as there is a natural drainage of privy vaults, stables, etc., constantly going into it. It appears that there had been a petition sent in to the commissioners of Richland County some two years or more ago, asking that the ditch be made a closed one of sewer pipe of sufficient size to carry off the water coming down that way. The matter was taken up by the county commissioners and a hearing given on July 28th, 1902. At that time a remonstrance was made by quite a number of residents of the village against this improvement being made as it was represented that it was the intention of certain parties along the line of the ditch to make a sewer out of it.

The commissioners, however, decided to put the matter through and the county surveyor was here last week making the necessary survey.

The corporation does not feel that they are in any way responsible for it, as it is in the hands of the county commissioners, and one of our councilmen at the hearing objected strenuously against the improvement being made if it was to be used for sewage purposes and the corporation was to be held responsible for any damage that may result therefrom. It appears to the council that as they have not sanctioned anything of the kind, that if any private individual or corporation should drain any sewage into this ditch after the improvement has been made, and any person should claim damages as a result of it, that it would be a private matter between the person or persons so damaged and the party or parties draining into it, and not a matter that the corporation should be held liable for.

We should, however, like to have your opinion on the matter, and any suggestions you may make and any advice you have to offer will be thankfully received and acknowledged.

Respectfully yours,

W. A. JEFFREY, *Clerk.*

This letter was answered as follows:

"COLUMBUS, OHIO, Sept. 25, 1902.

MR. W. A. JEFFREY,

*Village Clerk, Plymouth, Ohio.*

DEAR SIR:—I have your letter of the 24th, informing me that it is a county ditch that is being improved and not a new sewer being constructed in your village. This being the case it is out of the jurisdiction of this Board.

I presume you are correct in holding that should this ditch be used by any person for closet drainage and thereby occasion a nuisance, the village could not be held responsible for it.

Yours truly,

C. O. PROBST, *Secretary.*"

From information supplied by the health officer, it appears that the above mentioned ditch was transformed by the Richland County commissioners, at least or nearly its entire length, into a tile sewer, during the latter part of 1902 or the first part of 1903. This is in effect a new sewer, although certain short portions are yet uncovered and create very serious local nuisances.

The sewer as now constructed consists principally of 12 to 18-inch tile pipe and is about 3000 feet long extending in an easterly direction from the most thickly built-up portion of the village to the Huron River, into which it discharges at a few hundred feet south of Main Street, also



called the County Line Road, and about 2,000 feet above the ice pond which furnishes the village supply as above mentioned.

More than 40 houses have connections with this sewer. Through these connections is discharged kitchen wastes, bath tubs and water closets. The cost of the sewer was assessed upon the citizens of the corporation. The sewer is said to have been built principally for surface and ground water drainage, but there are unmistakable evidences of fecal matter and other wastes in it and also in the stream below the outlet.

There is also a sewer, or drain, 18 inches in diameter at its lower end, about 1500 feet long, in the northerly, or Huron County portion of the village. This sewer discharges into the Huron River at a point about 400 feet north of the county line road and about one-quarter of a mile above the previously mentioned ice pond. The sewer has been constructed by the trustees of New Haven Township, upon petition of several citizens of Plymouth. The cost was assessed entirely upon certain inhabitants of Plymouth. The sewer, though called a drain, at the time of its installation, is now used by some 30 householders for domestic wastes and sewage. A hotel is now being constructed which will be connected with this sewer later. Inspection of the outlet showed a considerable flow of decidedly strong sewage, which was creating offensive deposits along the side of the river.

A third sewer was found which had been recently constructed without the approval of the State Board of Health, with outlet into an open ditch, which ditch apparently leads into a blind drain, and this discharges on to the ground near the top of a high bank which borders the water works property. The outlet of this drain, as mentioned in the report on proposed water supply, is only about 75 feet above the new dug well of the village water-works. The number of houses connected with this drain was not learned. It was evidently put in primarily for storm water purposes, but the deposits at the end of it show that offensive matter of some kind is being discharged into it.

From all available information, it has been found that there are in the easterly and southerly portions of the village, at least, three sewers which have been constructed without the approval of the State Board of Health. One of the sewers has been installed by the county commissioners of Richland County; another has been installed by the trustees of New Haven Township and the third has apparently been constructed by the corporation. In all cases, however, these sewers have been paid for and are used only by people living within the corporate limits of Plymouth.

Inspection shows plainly that these three sewers are not in accordance with good sanitation and that one of them offers a danger to the water supply, while the two larger ones cause a distinct pollution of the creek and destroy its value for stock watering purposes, beside endangering the ice supply of the village.



The topography of the village, or at least the portion of the village under consideration, makes it possible to convey the sewage to one point and there purify it. This is apparently the only solution of the problem.

The other present sewers are built for surface and ground drainage purposes. It would be better and more economical in the end to build sanitary sewers to intercept all drains now discharging into the present sewers.

The Board, May 8, 1906, disapproved these sewers, which discharge respectively, at a point in the southeasterly part of the village near the top of a bank bordering the water-works property; into Huron River 200 feet south of Main Street, or County Line Road; and into Huron River at a point a few hundred feet north of said County Line Road; and six months time was given the village in which to construct an intercepting sewer to convey all domestic sewage to a point below the village and there purify it in a manner satisfactory to the State Board of Health. The authorities were notified that plans for this intercepting sewer and purification works must be presented to the Board for its approval before construction is commenced, and in case of failure to carry out this provision within the specified time, all householders must be compelled to discontinue the use of the present sewers.

The county commissioners and authorities of New Haven Township were also notified of this action.

In November, 1906, a communication was received from the health officer of Plymouth, stating that he had been requested by a number of citizens to ask the Board's permission to continue the use of these sewers for some time longer in the hope that, in the meantime, some interest might be excited among the inhabitants.

The matter was considered and on November 21, 1906, the Board voted to allow an extension of six months' time, or until May 8, 1907, to the village of Plymouth in which to build this intercepting sewer and purification works.

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## REPORT ON SEWERAGE AND SEWAGE PURIFICATION FOR RAVENNA.

On March 2, Mr. R. F. Proctor, representing Williams, Proctor & Potts, consulting engineers, of New York, submitted complete plans and specifications for a system of sewerage and sewage purification for Ravenna. In connection with the sewerage plans submitted in the past, the chief engineer had visited Ravenna; and was familiar with the topography and conditions relating to sewage disposal.

The following report was made:

At present there are few if any public sewers in Ravenna. Several small streams pass through the village and receive a considerable quan-

tity of domestic sewage. One of these streams receives the waste liquors from a woolen mill operated by the Cleveland Woolen Co. The main ditch below the village is highly polluted and has been the cause of complaints and lawsuits.

Plans for sewerage and sewage purification were drawn in the early part of 1905, by W. E. Myers, consulting engineer. These plans were approved by the State Board of Health, May 26, 1905, subject to the following conditions:

1. That the waste liquors from the Cleveland Woolen Co's. mill be treated in a manner satisfactory to the State Board of Health before being discharged into the purification works.

2. That samples of all filtering material be submitted to and receive the approval of the State Board of Health before being used; and,

3. That the purification works be built before any of the proposed sewers are used.

These plans, on account of local difficulties, were not carried out. The plans now submitted are intended to take the place of the first plans.

#### SEWERAGE SYSTEM.

In accordance with the plans now presented the domestic sewage of the entire village is to be collected by one main sewer, instead of by two main sewers as at first proposed, and conveyed to the purification works. The site for the purification works is the same as that already approved, and the effluent will be discharged into a ditch leading to Break Neck Creek as in the first plans.

The plans now under consideration call for 24 miles of sewers, the largest portion of which will be 8 inches in diameter. The main sewer is to be one-half mile long and 18 inches in diameter. About 13 miles of sewers will be built immediately. The grades of sewers are designed to give the usual velocity of two feet per second when flowing half full. The sewers are designed upon a basis of 28 gallons per lineal foot per day for laterals. Automatic flush tanks are to be installed at the ends of certain sewers; but in general it is intended to have the sewer system flushed by hand at stated periods.

The consulting engineers submitting the proposed plans claim that the sewers will not be used by more than 1,000 people within the next three years. This is a considerably smaller estimate than that of the engineers submitting the former plans. The estimated ultimate number of people that can use the system designed is 35,000. The ultimate capacity is 3,500,000 gallons per day.

#### SEWAGE PURIFICATION WORKS.

As discussed in the report on the previous plans, the sewage at Ravenna will consist almost entirely of wastes from the woolen mill.

Taking the estimate of the consulting engineers that 1,000 people will use the sewers at the end of three years, there will then be 100,000 gallons of domestic sewage and 200,000 gallons of industrial wastes to be treated. These industrial wastes will be turned into the system as soon as it is built and the village has agreed with the woolen mill company to satisfactorily take care of them and defend all law suits brought on account of the pollution of the stream below town. The problem for the present installation of purification works is therefore one of treating industrial wastes.

Since acting upon the first set of plans in May, 1905, the State Board of Health, as a part of its co-operative study with the United States Geological Survey of industrial wastes in Ohio, has made an extensive investigation into the character and possible methods of purifying the wastes from the Cleveland Woolen Co's. mill at Ravenna. From these investigations it appears that the cost of treating these woolen mill wastes with chemicals is too great to be considered by the village, and that recovery schemes would not be warranted on account of the small amount of material of value in these wastes.

Straining the wastes through coke breeze was experimented upon but found to be very expensive.

Sand filtration of this waste was not tried at Ravenna, but the Massachusetts State Board of Health has for several years experimented upon similar wastes, and found that this treatment would give satisfactory results. The consulting engineers have found sand banks from which they believe the sand can be obtained at a reasonable cost, when the purification of the sewage of the entire village is also taken into account.

The co-operative investigation further showed that the waste from the woolen mill was fairly stable, and would not, in an undiluted state, become much changed, by short periods at least in septic tanks. It was also shown that when these wastes were diluted two or three times by the water of the stream into which they discharge, the organic matter became less stable and tended to putrefy. The aeration obtained in the flow of about a half mile in this stream tended to greatly lessen the color of the waters.

The method of sewage purification now proposed for use at Ravenna is sedimentation followed by intermittent filtration through sand. The site for the purification works, already approved by the State Board of Health, is in the southwesterly part of the corporation.

In addition to the regular village plant, a settling basin and screen will be provided at the woolen mill so that the opportunity for the removal of a considerable amount of suspended matter will be provided before the sewage enters the village system. An aerating channel will be built with the idea of introducing as much oxygen as possible into the dye wastes in hope of obtaining a certain amount of decoloration.

The plans are designed on the basis of a flow of 600,000 gallons per day: 400,000 gallons of which is expected to be domestic sewage, and 200,000 gallons woolen mill waste. This nominal capacity of the plant is probably too great. From reliable information, however, it is believed that this daily flow of sewage will not exist for a considerable number of years. The plant makes a reasonable allowance, therefore, for the future.

The sewage, on arrival at the plant enters the general sedimentation (or septic) tanks. These tanks when finished will be five in number, each 100 feet long, 14 feet wide and about  $8\frac{1}{2}$  feet deep. Three of them will be built for present installation; each of the tanks holds 67,000 gallons. With a flow of 200,000 to 300,000 gallons, therefore, from 16 to 24 hours of sedimentation will be provided for. An adjustable weir at the outlet of each tank will permit the capacity to be further increased, or adjusted, if desired. At the center of the bottom of each tank is a lift valve through which the sludge can be drained out. The outlet pipe from this opening leads to a sludge bed 134 feet by 32 feet, which will probably give the sludge ample opportunity to dry and will prevent the necessity of polluting the stream at any time.

The effluent from the septic tanks passes into an aerating chamber and then to the dosing chamber, in which an automatic apparatus is to be installed for the purpose of dosing, in rotation, the sand beds. The dosing tank will hold from 25,000 to 75,000 gallons, as desired; and each bed will be covered by one dose to a depth of 1 to 3 inches.

The intermittent sand filtration beds are five in number; each being 153 by 232 or 4-5 of an acre in area. For present installation four of these beds with a total area of 3.2 acres will be constructed. The filtering material will consist of about 3 feet of sand, to be obtained from a local bank, and having an effective size of from .25 to .40 mm. and a uniform coefficient of not over 5. Under the sand will be a 6-inch to 8-inch gravel layer. Each bed will be underdrained by one line of 8-inch vitrified pipe; with parallel lines of 4-inch hexagonal drain tile, 16 feet apart, leading into it. The area occupied by the beds will be excavated in clay soil and the surrounding embankments of the filters will be of this material. Suitable troughs, of varying size, will be provided for distributing the sewage over the sand surface.

With four beds for present installation, the estimated rate of filtration through the sand for the next three years will vary from 62,000 to 90,000 gallons per acre per day; with the minimum amount of sewage it will consist almost wholly of factory waste as above described. Although no actual experiments have been made at Ravenna to show that these woolen mill wastes can be treated at such a rate, yet careful comparison with Massachusetts experiments show this rate to be entirely reasonable. Furthermore, the wastes at Ravenna will receive quite an extensive preliminary treatment before being applied to the sand,



which was not given the waste used in experimentation in Massachusetts.

March 7, 1906, the Board approved the plans for sewerage and sewage disposal as shown by the drawings submitted by Williams, Proctor & Potts, consulting engineers, on March 2, 1906; and also the construction, for present installation, of three of the five sedimentation tanks, and four of the five sand filters, provided:

1. That the operation of the plant be subject, at all times, to the approval of the State Board of Health.
2. That the sand filtration beds be increased in an amount satisfactory to the State Board of Health, whenever in the opinion of said Board the yield of sewage from Ravenna warrants such an increase; and,
3. That the sewage purification works be built before any of the proposed sewers are placed in use.

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#### REPORT ON PROPOSED STORM WATER SEWER FOR RISING SUN.

On April 5, Dr. H. L. Byington and Mr. Charles E. True, of Rising Sun, visited the office of the State Board of Health and called the attention of the secretary to a proposed storm water sewer to be built in their village; and left a sketch plan showing the proposed work. They stated that the sewer, as intended to be built, would be a menace to health and furthermore that it was to be installed without submitting same to the State Board of Health for approval. In reply to a letter the village clerk made formal request for an examination by the Board and submitted definite plans for the proposed sewer as adopted by council.

On April 18, the assistant engineer visited Rising Sun and examined conditions involved in the construction of the proposed sewer. The following report was made:

The village of Rising Sun is situated in the southeastern portion of Wood County. The site of the village is comparatively level and is drained by a small creek running northward through the western part of the built-up section. The whole neighborhood is underlaid with limestone rock, which extends to a great depth, and over most of the village comes to within a foot or two of the surface of the ground. Wells used for domestic purposes in various portions of the village, derive their supply from this rock. The rock is of the honey-comb variety and is filled with channels so that the movement of the ground water is very free, thus permitting pollution which has once entered the rock to find its way rapidly to the wells. In 1893 a severe typhoid epidemic,



due to the pollution of wells by poorly constructed privies was investigated by the State Board of Health. This epidemic demonstrated the necessity of taking every precaution against allowing polluting material to find its way below the surface of the ground. All privies have since been equipped with water tight tubs.

On Main Street, where it is proposed to lay the new storm water sewer, the rock comes, in many places, within a few inches of the surface and is never more than 3 feet below it. The ground water level along this street, as determined by measurements made on the depth of water standing in wells, is from 4 to 10 feet below the surface. The village authorities wish to have a new road-bed made for this street, the work to be done and partly paid for by the county. Along the north side of the street it is intended to lay an open jointed tile drain, with outlet into the creek in the western part of the village, for the purpose of draining the road-bed and carrying off surface drainage at several low points along this street, through catch-basins. The tile ordinarily laid for removing water from the body of the county roads is 4 inches in diameter, but inasmuch as considerable quantities of water remain on the surface of the ground near the intersection of Day Street with Main Street, it is proposed to increase its diameter to 8 inches and put in catch-basins (six in number) for removing this water more rapidly. This drain, as designed to be laid, is below the frost line at all points and 5 feet, more or less, above the ground water level. It is to have a grade of less than 1 in 1,000 for most of its length while, the steeper portion is slightly over 1 per cent. grade. It is maintained by some that this drain will be a great source of danger to the wells along Main Street since the water can readily flow out into the rock through the open joints or even penetrate the sides of the tile. They, therefore, object to its construction and recommend instead a cast iron pipe to be laid nearer the surface and no lower than necessary to carry off water from the low districts near Day Street. The fact that the iron pipe is laid near the surface and simply passes through the crest of the high ground on Main Street, emerging again into the gutter before reaching the creek, it is maintained, will counterbalance the additional expense of rock excavation in the case of open tile drain. This arrangement, of course, would not provide for draining the road-bed, but it appears that such drainage is unnecessary since the road, except near Day Street dries out within a very few hours after even a heavy rain. Objections to the iron pipe are: First, that in winter weather both ends may become clogged with ice and at such times it will fail to perform its function. Second, being so near the surface it may be burst by freezing, and third, it will discharge the drainage water into the gutter below Vine Street, which may prove a nuisance to persons living below the point of discharge. If as planned gutters should be built along this part of the street the nuisance would probably be negligible, but a large number of people are opposed

to the construction of such gutters and it is entirely possible they will prevail in their opposition. Those in favor of the open tile drain claim that the surface drainage of the street, even though it did leak through the joints of the tile, would not be dangerous to health; that it must receive some filtration before reaching the wells and that, in time, the sides of the rock excavation for the drain would become plastered with silt thus precluding possibility of water getting into the wells. This silting of the sides of the excavation should not be counted upon, however.

A vitrified sewer pipe, with carefully cemented joints, might be suggested as a way out of the difficulty, first, because it could be laid below the frost line, the same as the open tile with not very great additional expense; second, it could be made practically water tight and thus prevent pollution of the wells; third, it would not discharge into the open gutter, but directly into the creek. A vitrified sewer pipe would not, of course, drain the body of the road, but this is not necessary since the road seems to have a very good natural drainage. An objection, which is made to a vitrified pipe sewer is that a greater share of the expense of construction would fall on the village than on the county. It was also urged by some that a vitrified pipe, with cement joints, could not be laid with anything approaching water tightness, and that, therefore, it would be no better than a tile drain. While this is an exaggerated view, yet to be on the safe side and with but a few hundred dollars additional expense, the whole vitrified pipe sewer could be surrounded on the underside by concrete and thus prevent any possibility of leaky joints.

On April 27, a delegation from Rising Sun, consisting of Dr. H. L. Byington, representing a certain portion of the people who were in favor of an iron pipe sewer, Mr. A. J. Day, mayor, and five other citizens, representing the faction in favor of the tile pipe sewer, held a conference, by appointment, with a member of the State Board of Health, together with the secretary, chief engineer and assistant engineer, in the office of the secretary. The matter was fully discussed at this conference and the plans already submitted were left for formal action by the Board.

May 2, 1906, the Board disapproved the plans for a proposed 6-inch storm water sewer in Main Street to discharge into a county ditch at the foot of that street, unless such sewer be of vitrified pipe, surrounded by concrete, in order to prevent all possibility of leakage from it; or unless the sewer be built of iron pipe with leaded joints, laid at the same depth and discharging at the same point proposed for the tile pipe.

## REPORT ON PROPOSED SEWAGE DISPOSAL PLANT FOR THE MENNONITE OLD PEOPLE'S HOME NEAR RITTMAN.

On June 26, 1906, Mr. J. D. Mininger, superintendent of the Mennonite Old People's Home, near Rittman, requested advice from the State Board of Health relative to sewage disposal for that institution. On June 29, 1906, the chief engineer visited the locality in question and inspected the conditions involved. Plans were submitted by Mr. Philip Mackley, civil engineer, of Wooster, on August 2, 1906, and the following report made:

The Mennonite Old People's Home is located in Milton Township, Wayne County, about three miles southwest of Rittman. There are at present 30 occupants at the institution, but this number is expected to be increased to 50. The present daily water consumption is 1,000 gallons. The sewage under present arrangements is discharged into a cesspool near the building, from which it overflows into a small ditch leading to an intermittent stream tributary to Chippewa Creek. The present method of sewage disposal causes very offensive odors both to the occupants of the Home, to persons living in the neighborhood, and also to the occupants of a school house not far away. It is important, therefore, that better methods of sewage disposal be provided.

Under the proposed plans an 8-inch sewer is to be built from the Home to a point about 1,000 feet southeast on land recently purchased by the officials of the Home for sewage disposal purposes. This proposed site is within a few hundred feet of the county road, but is hidden from view by a steep bank.

The proposed plans provide for a septic tank  $2\frac{1}{2} \times 6 \times 5$  feet deep, holding 500 gallons, from which the sewage is to overflow into a flush tank of about the same capacity. The flush tank is to be discharged intermittently by means of an automatic siphon through a pipe leading to the filters. The plans as submitted show but one filter, but the engineer in the accompanying statement says that two will be substituted for the one, if desired. It would be essential to have two beds in order that one may be out of service part of the time for draining and cleaning.

The filtering material is about 4 feet deep and consists of 1 foot of fine sand and 2 feet of cinders, underlaid by coarse gravel. The filters are amply underdrained. The effluent is to discharge into a branch of Chippewa Creek. When filtered through the material proposed, the sewage will be undoubtedly purified in a very satisfactory manner.

August 8, 1906, the Board approved the plans for a sewage disposal plant for the Mennonite Old Peoples' Home, near Rittman, as shown on drawings submitted by Mr. Philip Mackley, consulting engineer, August 2, 1906, provided:

1. That two filter beds not less than 25 feet square be built, instead of the one bed shown on the plans.
  2. That the size of the septic tank proposed be reduced to a capacity of not over 300 gallons; and,
  3. That samples of filtering material be submitted to the State Board of Health for approval before this material is placed in the filters.
- Samples of the filtering material were submitted August 16, 1906.

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## REPORT ON PROPOSED SEWERAGE FOR ROCKFORD.

Mr. F. W. Miller, village clerk, April 10, 1906, made application for approval of a proposed sewerage system for the village of Rockford. The assistant engineer visited that place on May 15, 1906, made the necessary examination with the following report:

The village of Rockford is located in the north-central part of Mercer County, on the St. Marys River, and has a population of about 1,200. The surrounding country is gently rolling. Immediately below the surface there is a thick bed of clay, underlaid by an extensive bed of gravel at a depth of about 80 feet. It is from this gravel that the public water supply is drawn, as well as the supply of many of the private wells in the village. The watershed of the St. Marys River, above Rockford, is approximately 190 square miles in area. The first municipality below Rockford in Ohio which uses the stream for a public supply is Defiance. This city also receives the pollution from Fort Wayne and other points in Indiana. No measurements of the stream discharge at Rockford have ever been made, but, based on run-off data of the Tiffin River at Defiance, the nearest water-course for which such data are available, it would appear that the dry weather flow of the St. Marys River at Rockford is about 16 cubic feet per second. The average flow about 64 cubic feet per second and flood flow about 960 cubic feet per second.

The village, at the present time, is not equipped with a sewerage system designed as such, but there are several open jointed field tile drains, originally intended for removing storm and sub-surface drainage which have subsequently been tapped into for sanitary purposes. The most important of these drains passes down through the central portion of the village and discharges into an open ditch which carries the sewage a distance of several hundred feet to the St. Marys River. At time of examination, there was a flow in the ditch of about 25,000 gallons per day. The bottom and sides of the ditch were heavily coated with a growth that clearly indicated the presence of sewage and the odor, within 50 feet or so of the ditch, was quite noticeable. The other



tile drain was built jointly, by the C. N. Railroad and the village and runs just west of and parallel with the railroad tracks for the entire length of the village. This drain has an 18-inch outlet which discharges in an open ditch some 50 feet away from the river bank. The flow at time of examination was slightly less than that in the other village drain. Both in appearance and odor there was evidence of the presence of domestic sewage. These drains have now become entirely inadequate to take care of the sewage for the entire village and it is desired to put in a new sewerage system, on the combined plan, which will meet all the needs of the village for the next 20 years or more.

The system as proposed is to have two main branches, in a north and south direction, as shown on the engineer's drawing herewith submitted. The one passing through the alley between Main and Franklin streets and the other on Jay Street. Branches from these two main sewers can be built as needed to reach every portion of the village. At the present time, only a few branches are to be laid. That part of the system which is to be installed at once will comprise the following:

	228 feet of	5 inch	vitrified	pipe.
1,700	" "	8	"	"
949	" "	10	"	"
2,506	" "	12	"	"
2,441	" "	15	"	"
1,716	" "	20	"	"
9 lamp holes.				
7 manholes.				
34 catch-basins.				

The two principal lines of sewer are to be brought together near the river into a common outlet. The outlet is to be built of vitrified tile pipe, imbedded in concrete and will extend out into the river below the level of low water. The total cost is estimated, by the engineer, at \$10,315.

No provision has been made for reaching the houses, for sanitary purposes, between Main Street and Cincinnati Northern Railroad, and it is expected that these houses will, as most of them do at present, discharge domestic sewage into the tile drain that lies parallel to the railroad.

It is estimated that within the first few months 66 house connections will be made, and it appears likely that within several years at least half the population of the village will be tributary to the sewers.

Based on the present water consumption (35,000 gallons per day) it would seem that the flow of sewage, within a year, would be in the neighborhood of 20,000 gallons per day.

#### SUMMARY.

If the plans and specifications of the engineer are properly carried out the sewers will be constructed in a first-class manner. They will be



laid in such way that the system can ultimately be extended to reach the whole population of the village. At the present time, however, it is intended to provide only for the population lying west of Main Street; that on the east of Main Street and between the railroad must continue to discharge its sewage into the railroad tile drain which has its outlet on the bank near the river. With but a moderate additional outlay, a sufficient number of branches could be laid to take care of the latter district and so avoid danger to wells and do away with the nuisance caused on the river bank by the improper disposal of sewage.

The State Board of Health, June 4, 1906, approved the plans of proposed sewers for Rockford, as shown upon drawings prepared by C. M. Smith, consulting engineer, and submitted by Mr. F. C. Miller, village clerk, on April 10, 1906, provided:

1. That the present drain which parallels the Cincinnati Northern Railroad be discontinued for use as a domestic sewer.
2. That the proposed sewers be built on the separate rather than the combined plan and that all domestic sewage be collected through the system of small pipes and discharged into the St. Marys River at the location proposed near the foot of Franklin Street; and.
3. That sewage purification works, of a design satisfactory to the State Board of Health, be installed and placed in operation whenever, after investigation, such works are deemed necessary by said Board.

The authorities were also advised that when the question of sewage purification comes up, the separate system would be most economical and practical; and by reducing the sizes of the proposed sewers to 8-inch and 10-inch, a large sum of money can be saved and this sum may be put into storm water sewers of sufficient length, in connection with the paved gutters, to take care of all the storm water necessary.

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## REPORT OF PROPOSED SEWAGE DISPOSAL PLANT FOR SALEM.

October 1st, 1906, plans for a sewage disposal plant for the city of Salem were submitted by Chapin & Knowles, Canton, Ohio, consulting engineers. These plans were referred to the chief engineer, who had a few months previous visited Salem with reference to sewage disposal.

The following report was made:

The present population of Salem is about 8,000. There are at present 9 miles of sewers, mostly on the combined plan, discharging at three or four different outlets and causing objectionable conditions. Rough measurements show that the present yield of sewage from the city is about 700,000 gallons per day.

It is proposed to build an intercepting sewer to collect the sewage

of the entire city and convey it to a point two miles west of the corporation limits to a site for a sewage disposal works immediately north of the Pennsylvania Railroad. This site is very well adapted to the purpose. The plans for the sewage disposal works comprise septic tanks and intermittent sand filters, with provision for disposing of the sludge upon the land. These works are designed to treat 1,000,000 gallons per day.

The sewage on arriving at the plant will first pass into a so-called entrance chamber, 6 feet wide, 47 feet long, and 3 feet deep. The heaviest solid material settles in this chamber and can be drawn off at the bottom.

The sewage will next pass into one or all of three grit chambers, each of which is 8 by 20 feet in plan, and about 5 feet deep. The deposits in these are to be drawn off at the bottom and drained into a sump, from which they are to be pumped on to land provided for that purpose, by means of a small centrifugal pump driven by horse power.

The septic tanks, which will next receive the sewage, are in triplicate, each being 100 feet long, 26 feet wide, with an average depth of 9 feet. Each tank is divided longitudinally by two baffle walls which will cause the sewage to travel about 300 feet between the inlet and outlet. This is intended to have the effect of distributing the sludge more evenly over the entire length of the tanks.

The septic tanks and grit chambers are to be covered with a reinforced concrete roof, and ventilation is to be provided at both ends. The total septic tank capacity is 500,000 gallons. Based on a flow of 1,000,000 gallons in twenty-four hours, the sewage can be retained in the tanks either 4, 8, or 12 hours, as desired.

From the septic tanks the sewage will pass into the shallow open dosing pond, covering 0.8 of an acre, and having an average depth of about 2 feet, thus giving a capacity of about 500,000 gallons. It is probable that this dosing pond is too large for successful operation and that there will form in it offensive accumulations of sludge.

From the dosing pond the sewage will pass to one or two control chambers from which it will be distributed automatically on to the sand filters. These filters are eight in number and comprise a total area of  $5\frac{1}{2}$  acres. The filters are to be formed by earth embankments and filled with three feet of Lake Erie gravel. The gravel is to be used only immediately above and four or five feet on either side of the underdrains. Each filter will be drained by a main drain of 8-inch vitrified tile pipe, second quality, into which will lead the lateral drains, 3 inches in diameter, spaced about 30 feet apart. The bottom of the filters will be shaped into the ridges and valleys to facilitate the draining to the underdrains.

At a meeting of the State Board of Health, held October 17th, 1906, the plans were approved, provided:

1st. That the plant be enlarged, in a manner satisfactory to the State Board of Health, when deemed necessary by said Board;

2nd. That the dosing pond be reduced so that it will hold about 50,000 gallons;

3rd. That the automatic apparatus be replaced by a single siphon discharging, by means of gates, on to any filter desired;

4th. That the entire area of filters as shown on the plans be constructed as the first installation, and,

5th. That the method of operation of the plant be at all times satisfactory to the State Board of Health.

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### REPORT OF PROPOSED SEWER OUTLET OPPOSITE WARREN STREET, SANDUSKY.

It came to the attention of the State Board of Health that the city of Sandusky was about to install a new sewer outlet. The city engineer, Mr. A. C. Schultz, was notified and he submitted plans June 12, 1906, showing the proposed work. On June 19, 1906, the assistant engineer visited Sandusky, and the following report was made:

Sandusky is situated on Sandusky Bay, an arm of Lake Erie. The city has a population of 23,000 and covers an area of about 5.3 square miles. The principal industries in the city are a paper mill, several wine cellars, breweries and planing mills. There are at present about nine miles of paved street. All other streets are macadamized and many are in a rather poor condition. The entire sewage from the city, including manufacturing wastes, is discharged directly into Sandusky Bay. Most of the sewage enters the northwest water front of the city and it is claimed that this is rapidly carried out into the lake by a channel current passing close to the shore. It is quite probable, however, that with a strong northwest wind much of this sewage would be carried over the water-works intake which is off the northeast water front of the city. There are several sewers discharging also on the northeast water front, and about 3,000 feet to the southeast of the intake. The water in this neighborhood has very little current and it is difficult to state just what direction the sewage flows; it is quite likely, however, that with the wind from the southeast much of it would be carried over the intake. Many of the sewers of the city are in very poor condition and require reconstruction. The sewer needing most immediate attention is that which receives drainage from the eastern portion of the city and is at present conducted to the water front in a ditch directly under one of the tracks of the Baltimore & Ohio Railroad in Warren Street. Boards laid across the ties between the rails form the only covering for this ditch. As might be expected, there is considerable deposit of fecal matter along the sides and bottom of the ditch which, in warm weather, emits a very foul odor.

*Proposed Sewer.* It is proposed to replace this ditch with a well-

constructed reinforced concrete sewer which will have its outlet at the same point at which the ditch now discharges. This sewer, in addition to draining the territory now tributary to the ditch, will also relieve one of the sewers on the northeast water front and which is believed to be a serious menace to the public water supply. The proposed new sewer will be egg-shaped in section and will consist of 2,520 feet of  $4\frac{1}{2}$  feet by 3 foot section; 840 feet of  $2\frac{1}{2}$  feet by  $3\frac{1}{2}$  foot section; and 933 feet of 2 feet by 3 foot section. The number, size and length of new laterals tributary to this new sewer have not been determined, but will probably not be extensive since many pipes already in place will be used.

The sewer has been figured on a basis of 50 per cent. run off for storm water, 175 gallons per capita for domestic sewage. About 1,000 persons will be tributary. The total quantity which the sewer will ever be called upon to carry is estimated at about 5,000 cubic feet per minute. Introduction of a new sewer can hardly increase the danger of sewage pollution of the public water supply and might be expected to improve conditions in this particular to a slight extent, since a considerable amount of sewage will be diverted from the northeastern water front to the northwestern water front where it will be more quickly carried out to the lake and away from the water-works intake.

July 30, 1906, the Board approved the proposed sewer in Adams Street, to discharge at the foot of Warren Street, as shown on plans submitted June 12, 1906, by Mr. A. C. Schultz, city engineer.

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## REPORT ON PROPOSED SEWER IN MADISON AVENUE AND FOURTH STREET, STEUBENVILLE.

September 18th, 1906, plans were submitted by S. B. Curfman, city engineer of Steubenville for a proposed sewer in Madison Avenue and Fourth Street, to discharge into the Ohio River.

These were reported upon by the chief engineer as follows:

The district in question is located in the northerly portion of Steubenville, but about one and one-half miles below the water supply intake. It covers an area of twenty-five acres. The proposed sewers are to be on the combined plan. It is expected that about 500 people will use them in the near future, and that 1,000 people will ultimately connect with them. The streets through which the proposed sewers will pass are all paved. The flow of domestic sewage, it is estimated, will be not over 30,000 gallons per day; while the storm water flow will be at the rate of about 30,000,000 gallons per day, based on a rainfall of two inches per hour.

The proposed sewer will commence at the corner of Sixth and Ross streets and will then pass through a portion of Sixth Street, through



Madison Avenue to Fourth Street, and thence to the Ohio River where it will discharge through a submerged iron pipe terminating below water level in the river.

The proposed sewers are similar in design to other sewers which have been recently built in Steubenville with the approval of the State Board of Health.

October 4, 1906, the State Board of Health approved this sewer, as shown on drawings submitted September 18, 1906, by the city engineer.

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## REPORT ON PROPOSED SEWERAGE FOR DISTRICT NO. 42, SUB-DISTRICT NO. 1, TOLEDO.

At a meeting of the Board held in Canton on June 19, 1906, application was made by the city engineer of Toledo, Mr. F. I. Consaul, through the resident member, asking the Board to reconsider its former action on the sewerage plans for District No. 42, Sub-district No. 1, and if possible to remove or modify the conditions attached to the approval of these plans. This application was referred to the president and the chief engineer of the Board, as a special committee, for investigation and report. On June 30th the committee inspected the conditions involved and the following report was made:

At the regular meeting of the State Board of Health held on October 25th, 1905, plans for proposed sewerage for Sewer Districts No. 41 and No. 42 were submitted by Mr. F. I. Consaul, city engineer of Toledo.

These plans were referred to a committee of two, consisting of the president and engineer of the Board. The following is quoted from the report of the committee made at that time:

"One outlet is to drain Sub-district No. 1 and discharge into the Ottawa River at a point 800 feet north of Central Avenue near the southerly portion of the main district. On the opposite side of the stream from the proposed point of discharge is property which is or will be used for park purposes. On the same side of the stream are half a dozen houses within a few hundred feet of the outlet.

"The outlet will be several hundred feet above the backwater influence from the lake and very little dilution of the sewage will be obtained. The location proposed is below the outlets of districts No. 26, No. 27 and No. 40, already approved conditionally; and above the outlet from District No. 16 (discharging into deep water) already approved.

"The sub-district comprises about 40 acres and includes most of the present built-up portion of the main district. About 750 feet of 30-inch brick sewer will be built immediately and into this will be discharged the sewage from forty houses, containing a population of over 200."



The following action was taken relative to Sub-district No. 1, District No. 42:

"The proposed sewerage for Sub-district No. 1, of the main Sewer District No. 42, is approved provided that the outfall sewer for this sub-district be extended down the Ottawa River to a point beyond land which is to be used for park purposes and that the dry weather flow, at least, be discharged into deep water through a submerged outlet; and provided also that whenever this outlet becomes a nuisance, in the opinion of the State Board of Health, provision shall immediately be made for disposing of the sewage being discharged thereat, in a manner satisfactory to the State Board of Health."

The present inspection shows no change in the conditions relating to this project. As discussed in the former report, installation of a sewer such as proposed would probably create offensive conditions from the beginning, and would further complicate the already unsystematic, uneconomical and unsanitary arrangement of the Toledo sewers.

July 7th, 1906, the Board voted to sustain its former action taken December 1st, 1905, as quoted above.

The Board suggested that it would be possible, without a greatly increased total cost, to install an 8-inch or 10-inch main sewer, to be used for house drainage only, instead of the 30-inch sewer proposed; and to use the amount thus saved in constructing a small sewage disposal plant for this sub-district.

The possibility of extending the sewer in Central Avenue to include the sub-district in question was also suggested.

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## REPORT ON PROPOSED SEWER FOR A PORTION (THIRD WARD) OF WARREN.

Mr. Thomas B. Webb, sanitary policeman of Warren, January 17, 1906, made application for approval of a new sewer to drain a small district in the northwestern part of the city. On February 1, 1906, the assistant engineer made the necessary investigation with the following report:

It is proposed by the city of Warren to construct a sanitary sewerage system to care for the sewage from the district on the west side of the Mahoning River and lying between Dickey Run on the north, Hoyte Run on the south and the city line on the west. This district comprises about 70 acres of land, which is at the present time but partially built up. The sewage is to be discharged untreated into the Mahoning River. About one hundred houses will be connected with the sewers in the beginning and the number can scarcely be more than doubled later. Esti-

inating three and one-half persons to each house, the number tributary to the sewers will be 350.

The sewers have not yet been laid out but will probably be arranged as shown on blue print submitted. They will be of vitrified sewer pipe with cemented joints, excepting the outlet to the river which will be of cast iron bell and spigot pipe extending about 30 feet into the stream and discharging below the surface of the water. Judging from the appearance of several other small sewers discharging into the river in this manner, no nuisance need be anticipated.

The main sewer leading to the river will be some twelve to fifteen feet above the water level and will enter the river with a sharp bend downward. This elevation of the main sewer will permit it to be connected with the interceptor, should such be built to carry all sewage to purification works below the city.

February 28, 1906, the Board approved the proposed sewer for the Northwestly or Third Ward District of Warren, to discharge into the Mahoning River between Mason and West Prospect streets upon condition that this sewer be connected with an intercepting sewer for the entire city as soon as such sewer is built.

The authorities were notified that in accordance with the approval of proposed additional sewerage in 1895, a condition was imposed whereby the city was to install means for purifying the sewage of the entire city within two years from date of approval, and that it was the intention of the State Board of Health to make, as soon as dry weather conditions prevail, a thorough examination into the discharge of sewage at Warren, that the result of this examination would probably show such objectionable conditions that the Board would find it necessary to require purification works for the city to be built at once; and the city authorities might therefore desire to postpone the construction of the proposed sewer in the Third Ward of Warren until permanent arrangements for the disposing of the remainder of the city's sewage are made.

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## REPORT ON PROPOSED SCHEME OF SEWAGE DISPOSAL FOR URBANA.

In a letter dated May 12, 1906, Mr. William R. Wilson, mayor of Urbana, made application for the Board's approval of a proposed method of disposing of the sewage of Urbana when the proposed system of sewers (already approved by the Board) was completed. Accordingly, on May 16, 1906, the assistant engineer visited Urbana, to make the necessary investigation.

The city of Urbana is situated in the central portion of Champaign County, has a population of about 8,000 and is one of the oldest towns

in the state; it has had a water supply since 1878, furnished to the city by a private company. This supply is derived mainly from one large dug well, 20 feet in diameter by 23 feet deep; the water coming from a gravel stratum underlying a thin layer of blue clay. To date, there has been no sewerage system and wastes have all been disposed of in leaching cesspools or open drains passing through the city, thus frequently causing nuisances, seriously polluting many private wells, and endangering the public supply. The necessity of a proper sewerage system for Urbana has repeatedly been brought to the attention of the State Board of Health. In 1899 the village requested an investigation of the suspected pollution of private wells and the public supply. This investigation indicated that many of the private wells were grossly polluted and cases of typhoid fever were traced to their use. The public supply, while shown to be in danger of pollution, was, at the time, pure. In 1904 the mayor of the city asked for an opinion of the Board on the desirability of a sewerage system. In accordance with this, the engineer of the Board made an investigation of conditions in the village and concluded his report as follows:

"From previous investigations made by the State Board of Health, and also from information obtained from the city officials during the recent investigation, it appears:

First, that the use of cesspools under the conditions which obtain at Urbana is unsatisfactory, unsanitary and dangerous to the health of persons owning the cesspools and to the community at large.

Second, that private wells have become badly polluted on account of the large amount of filth which has been placed in the ground.

Third, that the public water supply, though still safe and usable water according to an analysis made a year ago, is liable at any time to become seriously affected whenever the natural agencies refuse to purify the filth which is being placed in ever increasing amounts into the ground beneath the city.

Fourth, the city of Urbana should install a sewerage system and sewage disposal plant, and abolish all present cesspools and vaults. As a preliminary step towards accomplishing this, a competent engineer, well informed and experienced in matters pertaining to sewerage, should be retained at once to make the necessary surveys and plans."

A copy of this report was sent to the mayor of Urbana on January 3, 1905.

In 1905 the city submitted to the Board, for approval, a set of plans for a sewerage system and sewage purification works, which were duly approved October 17, 1905. The method of purification provided was treatment in septic tanks, followed by contact beds.

The city of Urbana is very heavily in debt, due to an investment in a plant for supplying the city with natural gas, which ended unfortunately owing to the supply of gas giving out after the plant had been in operation somewhat over a year. It is desired, therefore, in

the construction of a sewerage system to economize wherever possible, and to this end the authorities have attempted to find a cheaper, but at the same time an efficient, method for the final treatment of the sewage. It occurred to them that the sewage might be disposed of with the wastes from one of the mills of The United Box Board & Paper Co. which is located in Urbana. This mill, which has a capacity of about 35 tons of finished product per day, discharges vast quantities of liquid wastes, amounting to something over a million gallons per day and containing about 18 tons of fine material washed from the straw, about 7 tons of caustic lime and several hundred pounds of calcium chloride. These wastes are conveyed to a 40-acre tract of land which has been converted into a shallow reservoir by throwing up earth embankments along its boundary, and there stored until a freshet permits it to be discharged into Dugan Creek, a tributary of Mad River, without nuisance. It might be added, at this point, that the strawboard company has purchased an additional 60 acres which it proposes to convert into a reservoir in the same manner as the original 40 acres for receiving the wastes after the present reservoir will have been filled. Under the present arrangement, the waste is discharged from the reservoir at times of high freshets, under which circumstances no great nuisance is caused in the stream below. It has been found to fill up so quickly, however, that it sometimes becomes necessary to permit the waste to flow into the stream before a sufficiently high freshet takes place. The additional area will provide sufficient storage capacity to obviate this necessity and will also take care of waste from the strawboard machines which is now being discharged directly into the stream. The waste liquid, on account of its stable composition and the presence of caustic lime, putrefies but slowly. It occurred to the city authorities that sewage introduced into this waste would be made innocuous, owing to the presence of the large amount of caustic lime, and it was therefore considered that the sewage of the city could be, for a time at least, discharged into the reservoir without causing a nuisance. It is for such method of disposal that the city now desires the approval of the State Board of Health.

An examination of the reservoir containing the waste from the strawboard mill showed that it was not wholly unputrescible, as the authorities were led to believe, since over a large part of the area of the reservoir a very distinct barn-yard odor was noticeable, due to the decomposition of the waste. At the outlet, the color of the waste was perceptibly darker than at the inlet, giving additional evidence of the change taking place. Furthermore, at the time of examination a small amount of leakage was taking place through the outlet gate, which leakage trickled down into a small pool containing considerable slimy growth, and in this pool the waste was observed to be almost black, but no odor more disagreeable than that from the reservoir was noticeable.



In order to study the effect of the addition of sewage on the putrescibility of the waste, a sample as it comes from the mill was collected for treatment in the laboratory. Portions of the sample were mixed with varying percentages of fresh domestic sewage, and, in order to secure nearly actual conditions in the reservoir, was placed in shallow glass dishes with loose covers allowing a free circulation of air and placed in the sun on the roof of the new state building. After four days, an odor of putrefaction was noticeable in mixtures containing 20, 35 and 50 per cent of sewage. After six days all the dishes containing sewage to the amount of 10 per cent and over dried out and the progress of putrefaction could no longer be followed. The mixture containing 2 per cent of sewage was placed in a beaker so that it did not evaporate so rapidly. After 10 days this mixture was found to have undergone no change detectable by the odor. The odor of putrefaction in no case was very offensive, but was the characteristic barn-yard odor noted in the vicinity of the reservoir. Except in the case of the mixture containing 2 per cent of sewage, the solid matter was very effectively settled out, leaving above a clear, yellow supernatant liquid. This phenomenon has been noted before by Mr. Earle Phelps and Mr. Herman Stabler, engineers in the employ of the United States Geological Survey, but they could advance no theory as to its cause. In spite of the fact, however, that the sewage would have this effect in settling out the solid matter contained in the waste, the advantage that might be gained would not be at all in proportion to the nuisance caused by the increased putrefaction due to the addition of the sewage.

Further experiments with larger quantities of waste would be instructive regarding the intensity of putrefaction and rapidity of sedimentation caused by the introduction of sewage, but the fact would still remain that the introduction of sewage increases greatly the putrescibility of the waste.

June 6 a letter was sent to the mayor of Urbana, stating that from the report of the engineer and from a study of the character of strawboard waste before and after mixing it with sewage, it appeared that if the city should discharge its sewage into the reservoir, as proposed, the whole mass of strawboard waste, as well as the sewage, would putrefy and become a serious nuisance to the neighborhood.

He was advised that the chloride of lime, which he states in his letter was contained in the strawboard wastes, was simply calcium chloride and not hypo-chloride of lime, or bleaching powder, a strong disinfectant, and that chemicals contained in the strawboard wastes would not dispose of the sewage as he suggested.

It was further stated that the question of disposal of strawboard wastes had been one of great importance in the state for many years and much of our most objectionable stream pollution was caused by such



wastes; that if, after the city's sewage was discharged into the reservoir, pollution of the stream should take place, as it very likely would, then the city might be liable in damages, as well as the strawboard company, and be forced to pay in damages an amount which would go far towards building a suitable purification plant; that, as he knew, the Board had in 1905 approved a system of sewerage and sewage purification for Urbana which would satisfactorily solve the problem at no unusual expense, and that for reasons above stated it would recommend to the Board that the proposed plan be disapproved.

After receiving this letter this scheme for disposing of the sewage of Urbana was abandoned by the city officials.

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### REPORT ON CONSTRUCTION OF PROPOSED LATERAL SEWER AT WELLINGTON.

The assistant engineer visited Wellington on August 1, 1906, for the purpose of making an investigation of a proposed lateral to one of the main sewers already existing in that town.

The following report was made:

The village of Wellington is in the southwestern portion of Lorain County and has a population of about 2,500. The village is built on very level land which has its principal drainage toward the north into several small streams. The removal of surface drainage in the town is provided for by means of a number of vitrified pipe sewers laid with open joints. These have been built from time to time and not in accordance with any consistent plan. The outlet sewers have been in existence for a great many years and discharge into a small ditch running toward the northwest along the Big Four Railroad tracks for perhaps a distance of half a mile; then turning north it enters one of the small streams above referred to. It is proposed to construct a lateral along Courtland Avenue 1,800 feet in length and 2 feet in diameter connecting with an existing 2-foot sewer starting at the corner of Courtland Avenue and East Main Street. It was evident at once during the investigation that the construction of the proposed lateral was not a matter which should properly come before the State Board of Health, as it is merely an extension of existing sewers. Since, however, there were complaints condemning the proposed extension for sanitary reasons, an examination of the ground was made in order to ascertain the facts in the matter. The objections raised are as follows:

- 1st. That the sewer with which the lateral is to connect is not large enough to receive the surface drainage at the present time and conditions would be made worse by the supposed increased flow to be carried in by the new lateral.

2nd. The land at the corner of Courtland Avenue and East Main Street is now frequently flooded, the water entering cellars and leaving deposits of mud. Should the new sewer be constructed, cesspool overflows will undoubtedly be connected with it and the mud then deposited at times when cellars are flooded will contain a large amount of sewage material which would be injurious to health.

In connection with the first objection it may be said that the trouble is not in the size of the sewer, but in the manner in which storm water gains access to it. The end of the present sewer is left open and lies in the lower end of the ditch or gutter extending along one side of Courtland Avenue. In order to protect large material from entering the sewer a number of iron rods are placed in front of the opening. In time of storm material caught on these iron rods blocks the entrance to the sewer to such an extent that it requires some time before the water can be carried off. Suitably constructed catch basins would have obviated all this difficulty. The proposed lateral should, therefore, improve conditions in this respect, for it will not carry materially more water than the gutters at present do (since it is not to drain any additional territory) and will carry the water directly into the old sewer without the possibility of clogging.

Regarding the second objection, while it is quite likely that cesspools will discharge into the proposed sewer, the amount of this flow will undoubtedly be small; therefore, in times of heavy storm, when the sewer is likely to overflow, the cesspool material therein will have been thoroughly scoured out long before such overflow takes place.

While a sewer laid with open joints is not generally to be recommended, construction of such a one in the present instance can hardly be condemned, for the reason that all sewers in the village are so built, and, therefore, cementing of the joints of the proposed sewer will have no material advantages.

A communication was addressed to the mayor of Wellington, August 30, 1906, and he was advised that this new sewer would be entirely unsuitable to receive cesspool overflow or other domestic wastes, which was the case with some of the sewers already installed; that the Board believed it to be important that the council should adopt and enforce rules forbidding the use of this sewer for domestic purposes, and would suggest that the question of constructing a system of sanitary sewers with carefully cemented joints and provision for disposal works should be given early consideration.

REPORT ON PROPOSED EXTENSION OF A SEWER IN  
WEST JEFFERSON.

It having come to the attention of the State Board of Health that West Jefferson was contemplating building a new sewer the assistant engineer visited that village on July 23, 1906, made an inspection in company with a member of the council, and submitted the following report:

West Jefferson is a small village in the extreme eastern part of Madison County and has a population of about 900. The surrounding country is comparatively flat, although in the eastern part of the village there is a moderate slope toward the valley of Little Darby Creek. The village is built on a thick deposit of sand and gravel. There are no industries of any magnitude in the village, and it is primarily a farming and trading center. As yet, there has been no public water supply installed, though it has been from time to time agitated. There are some deep wells in the town, which are artesian in character, but most of the wells at present in use are dug wells seldom over 30 feet in depth and deriving water from the lower layers of the gravel deposit.

*Present Sewers.* About fifteen years ago it became necessary to drain the streets of storm water; this had been previously ineffectually accomplished by an open ditch running through the center of the town in a general east and west direction toward Little Darby Creek. Accordingly sewer pipe with a number of laterals was laid in the open ditch, after which the ditch was filled in. All of this sewer, with the exception of the street crossings, was built by private parties, owning the ground through which the ditch ran. The pipe is uniformly 18 inches in diameter, of vitrified tile, and is laid with open joints. From appearances the work was but indifferently well done. The outlet of this sewer is in the remaining portion of the old ditch which flows through private land, passing near one residence and a flour mill, and into the flour mill head-race.

Inasmuch as several cesspool overflows are connected to the sewer and it is the practice among a great many to empty sink wastes and other refuse capable of undergoing decomposition into back yard catch basins, nuisances are frequently caused in the ditch into which the sewer discharges. Such nuisances have been the cause of repeated complaints by the owners of the residence and the mill above referred to.

*Proposed Sewer.* It is now proposed to extend the sewer by means of an 18-inch vitrified pipe, laid with Portland cement joints, and discharging into the tail-race of the above mentioned mill. It is believed that the volume of water and rapid current in the tail-race will effectually remove all sewage and storm water without creating a nuisance. It should be noted, however, that the original sewer is laid with open joints, so that the discharge of sanitary wastes into it is a danger to nearby

wells. Should the extension of the sewer be permitted, it will be an encouragement to the discharge of more and more such wastes into it. The waters of Little Darby are not used as a public water supply at any point below West Jefferson, and the flow is no doubt sufficient to care for the sewage of the village for a number of years under present conditions. With the introduction of a water supply (not a remote possibility) the sewage flow will be greatly increased and purification may become necessary. Therefore, it would be wise for the village to plan a comprehensive system of separate sewers with all the sanitary sewage brought to one point so that a purification plant may be ultimately installed with a minimum of expense. Such a system could be constructed little by little as needed.

It would seem desirable to caution the village authorities to remove as soon as possible all cesspool connections from the present sewers and cause all cesspools and vaults to be made water tight.

August 15th, 1906, the Board disapproved the proposed extension of the present sewer in the village of West Jefferson intended to discharge into the mill race leading to Little Darby Creek, unless all connections with the present sewer for overflows, cesspools and other domestic wastes be first cut off and the proposed sewer and all sewers connecting with it be used for storm water only.

The attention of the authorities was also called to the importance of the village taking steps to provide a suitable sewerage system for domestic sewage.

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#### REPORT ON AMENDMENT TO PROPOSED SEWERAGE PLANS FOR WILLOUGHBY.

On May 4, 1906, a communication was received from C. C. Jenkins, the village clerk of Willoughby, stating that the people of the village desired to install sewerage but wished to locate the main outlet at a different point from that already approved by the State Board of Health. At the same time the consulting engineer, Mr. J. C. Ward, urged that the matter be investigated at once.

The chief engineer visited Willoughby on May 5th, and inspected the territory involved. He found that the officials had in mind making use of the present storm sewer, owned by the Lake Shore & Michigan Southern Railway Company and discharging at the railroad bridge. After an informal discussion as to the disadvantage of this scheme, they abandoned this project and decided to locate the outlet at a point further down stream as is discussed in the following report:

In April, 1904, the State Board of Health considered general plans for a sewerage system for Willoughby, drawn by Mr. J. C. Ward, consulting engineer. This system calls for an outlet into the Chagrin River



about a mile below the edge of the built-up portion of the village. These plans were approved upon the following conditions:

1st. That the 'outlet pipe be so located and constructed that no nuisance will be caused to those living nearest to it; and

2d. That purification works, satisfactory to the State Board of Health, be installed when deemed necessary by said Board.

It is now proposed to change these approved plans so that the outlet will be at a point not less than 700 feet below the highway bridge at Lake Street or Mentor Road. The river at this point is quite deep and conditions are favorable for a submerged outlet. The nearest house to this point is 500 feet distant, and the edge of the built-up portion of the village is a few hundred feet further distant. With a submerged outlet there could be no objection on account of odors arising at the point of discharge.

The flow of the Chagrin River, discussed in a previous report, is quite sufficient to satisfactorily dilute the sewage of all the inhabitants of Willoughby who will use the sewers for some time to come.

The Board considered this proposed amendment to general plans for the sewerage system of Willoughby, approved, conditionally, on April 28, 1904, said amendment to consist in locating the main sewer outlet at a point at least 700 feet below the highway bridge at Lake Street or Mentor Road, so-called, instead of at the point shown on the plans previously approved, and on May 11th, 1906, the proposed amendment was approved, provided that the amended plans be subject to the same conditions of approval as were the former plans, quoted above.

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## REPORT ON PROPOSED SEWAGE PURIFICATION PLANT FOR WOODCREST, YOUNGSTOWN.

On August 3, 1906, plans for a sewage purification plant for Woodcrest were submitted for approval by Mr. Harry M. Reel, of Youngstown. Suggestions for desirable changes in these plans were made informally and amended plans, in conformity with these suggestions, were submitted on August 14, 1906. The following report was made:

Woodcrest is a suburb of Youngstown, located a few miles from the center of the city in a northeasterly direction.

The number of people for which the sewage plant is to provide is seventy-five, the nominal capacity of the plant is rated at 7,500 gallons per day; but this figure will probably not be reached for some time.

The sewage, which consists of domestic wastes only, is to be discharged into a concrete septic tank, 11 feet 6 inches long, 6 feet wide, and 5 feet deep, holding 2,500 gallons, or eight hours flow when the plant is treating 7,500 gallons per day.



The effluent from the septic tank is drawn off through a screen and over a weir into a feed chamber or flush tank. This chamber holds 350 gallons, and is to be discharged automatically through a  $3\frac{1}{2}$ -inch Miller siphon into the sprinkling filter. The tank and dosing chamber are to be covered by a wooden roof.

The sprinkling filter is 15 feet square and it is to contain  $5\frac{1}{2}$  feet of material. It is to be underdrained by a 4-inch drain tile spaced one foot center to center. These lead into a 10-inch rectangular conduit passing under one end of the filter.

The filtering material is to consist of selected gravel. The layer directly over the underdrains will consist of pieces  $2\frac{1}{2}$  inches to 4 inches in size, while the upper 5 feet will be material ranging from  $\frac{3}{4}$ -inch to 2 inches in size.

The distribution system will consist of a grid of galvanized iron pipes suspended at an elevation of 2 feet above the surface of the filtering material. The main pipe of this system is to be 4 inches in diameter and at intervals of 3 feet 9 inches,  $1\frac{1}{2}$ -inch lateral pipes will branch out. Into these lateral pipes will be inserted sprinkling nozzles spaced 3 feet 9 inches center to center. These nozzles consist of a simple opening  $1\frac{1}{32}$  inch in diameter in the bottom of the galvanized iron pipe and a brass disc placed directly under the orifice and 2 inches from it. This disc is held in place by a hanger resting on the pipe. The sprinkling filter will be covered by a roof of hollow tile which will allow ventilation and at the same time tend to prevent freezing.

When the plant is treating 7,500 gallons of sewage per day the rate of filtration will be 1,500,000 gallons per acre per day.

September 5th, 1906, the Board approved the plans for a sewage purification plant for the suburban settlement of Woodcrest, as shown on drawings submitted by Mr. H. M. Reel, consulting engineer, August 14th, 1906, provided the plant be enlarged, if considered necessary by the State Board of Health, when the amount of sewage to be treated by it exceeds 7,500 gallons.

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#### REPORT ON PROPOSED STORM SEWER IN NORTH SEVENTH STREET, ZANESVILLE.

It having come to the attention of the Board, through its resident member, that the authorities of Zanesville were about to construct a sewer in North Seventh Street without the approval of the State Board of Health, the chief engineer visited Zanesville on February 10, 1906, and the following report was made:

In December, 1904, the State Board of Health disapproved the construction of a combined sewer in North Seventh Street in the same location and of practically the same design as the one now proposed for

storm purposes until the city should take steps to procure a new source of water supply or to filter the present water supply.

As discussed in the report upon the former sewer, Zanesville is now polluting its own water supply to a serious extent by discharging sewage into the Muskingum River above the dam and the typhoid fever rate in this city is very high.

If the present proposed storm sewer were constructed there would be no doubt, judging from experience with storm sewers located in cities where there is no domestic sewerage, that this sewer would be used for sewage of all kinds.

The Board therefore disapproved the construction of either a combined or a storm water sewer in North Seventh Street until such time as a new suitable public water supply is provided, and the board of public service of Zanesville was so notified February 17, 1906. Their attention was called to the Board's disapproval of this sewer in December, 1904, and they were advised that it had been found from experience that almost invariably where a storm sewer had been built in a street not having domestic sewerage, such storm sewer was used, sooner or later, for domestic wastes.



# TYPHOID FEVER.

(197)





## REPORT UPON AN INVESTIGATION OF AN OUTBREAK OF TYPHOID FEVER AT CHARDON.

On account of the prevalence of typhoid fever at Chardon, the health officer, Mr. Hervey L. Williams, asked the State Board of Health to make an investigation. Accordingly, the bacteriologist and chemist visited that village on March 30th and 31st, and the following report was made:

Chardon, the county seat of Geauga County, has a population of some 1,700, and is situated on the top and sides of a large hill. In shape this hill resembles a truncated cone. The village has no public water supply, and no system of sewers, although there is an occasional sewer. The excreta is largely handled by the dry earth closet. There are some privies where the fecal matter is received upon the ground, in boxes or vaults. The water for domestic use is derived from drilled wells ranging from 30 to 60 feet in depth. Some of the older wells are dug, and springs occur near the foot of the hill. The soil formation is a sandstone rock overlaid with varying depths of gravel loam and some clay.

Obtaining the usual data, it was found there had been seven cases of typhoid fever and one death in the village, and two additional cases in the nearby country. It is possible these two do not belong to the Chardon outbreak, but are included for the present, as they were frequently at the village.

Some forty years ago there was quite an epidemic of typhoid at Chardon, but of late years this disease has appeared in the vicinity only as an occasional imported case.

The following table gives the more important facts concerning the cases:

DATA FOR TYPHOID CASES AT CHARDON.

Case No.	Date of attack.	Age	Water.	Milk.	Raw oysters.	Lettuce, Etc.	Away from Chardon.
1	Dec. 3	30	public and own well	Hazen and Canfield	yes	yes	yes
2	Dec. 3	25	own well	own cow	?	?	?
3	Feb. 24	39	own well	Hazen (coffee only)	yes	no	no
4	Feb. 27	12	own well	neighbor's cow	?	?	?
5	Mar. 8	25	same as No. 6	same as No. 6	never	yes	yes
6	Mar. 9	50	own well	own cow	yes	yes	yes
7	Mar. 11	21	own well	Hazen (did not drink milk)	no	no	no
8	Mar. 11	16	own well and school	Hazen (only a trace for coffee)	no	no	no
9	Mar. 20	20	own well	neighbor's cow	not for a month	no	no

## SOURCE OF THE INFECTION.

*Milk.* From the table it is evident that the outbreak was not due to infected milk, since only four cases used milk from a common source, and three of these barely used any milk. As the milk dealer referred to supplies from 40 to 45 per cent of the population, some cases would naturally appear among his customers with the trouble originating elsewhere than in the milk. Furthermore, the absence of cases among the young counts very strongly against milk infection.

*Foods.* In a consideration of infection by articles of food, the season of the year eliminated flies as carries of the disease. Again, it is evident from the data for oysters and green vegetables that only a part of the cases could have received their infection in this manner, while the others most assuredly did not, as the information was most positive on the use of such foods.

*Infection outside of Chardon.* As four of the cases had not been away from the village prior to the attack and three had been away although only for a day or so, it is evident the infection should not be ascribed to an outside source.

*Water.* With all the cases except two using water from entirely different wells it is needless to say there is no common source for an infection by water except there be a general infection of the water underlying the village. If such a condition existed additional cases would doubtless have appeared, but as none have been reported to date, it would seem the outbreak is at an end.

*Relation of cases.* Aside from cases Nos. 5 and 6, who lived in the same house, the cases were about as widely distributed over the village as could be. Continued efforts failed to reveal any common ground for connecting more than two or three cases in any direction. They represented different circles in social, religious and commercial life. The dates of the cases, together with the findings of the investigation, would indicate that there was no common source of infection, as is often the case in such outbreaks.

## GENERAL QUALITY OF THE WATER IN CHARDON WELLS.

Samples were taken from wells in various parts of the village to ascertain the extent to which the drinking water had become polluted, since it is only a question of time and added pollution when the water of the local wells in a thickly inhabited community will show sewage influences in the absence of sewers or other proper provision for disposal of all the sewage.

The results of the analyses are given below, arranged in groups according to the location of the wells:

## PARTS PER MILLION.

	Oxygen required.	Chlorine.	N. as nitrites.	N. as nitrates.	No. of bacteria.	Colon present in 50cc.
<i>Central Group.</i>						
Public well .....	.51	5.7	.060	2.0	350	no
Fowler .....	1.40	16.4	trace	14.0	45	no
Pomeroy .....	1.40	15.2	trace	14.0	1600	no
Whresher .....	3.32	35.0	Mere tr.	16.0	1500	no
<i>East Group.</i>						
Miller .....	2.96	13.6	.004	16.0	8000	no
Carlson spring .....	1.60	15.4	.002	8.0	100	no
<i>South Group.</i>						
Smith .....	3.40	27.2	.002	20.0	1900	no
Ferris .....	1.64	25.4	none	10.0	325	no
<i>West Group.</i>						
Waters .....	1.28	21.4	.002	2.0	2600	no
Carver spring .....	2.64	42.8	none	10.0	1200	no
Toop spring .....	1.20	28.2	trace	4.0	23	no
Throup .....	2.78	24.5	none	10.0	7000	no
<i>North Group.</i>						
Swen and Hertsog.....	1.78	18.8	none	3.0	150	no
Kiser .....	3.34	15.0	trace	none	1700	no
Sampson .....	1.24	23.2	.002	3.0	58	no
<i>Northwest Group.</i>						
Rush .....	1.26	2.2	trace	none	8	no

It will be seen by the nitrates and chlorides that in all but some three or four wells there is shown a marked "past pollution" influence, which means that the water has been in contact with sewage material and still shows the soluble effects of the pollution. This variation points to local influences such as privy vaults, etc. The public well by its location is farther removed from such polluting agencies and is much lower in chlorides and nitrates. The Rush well is far removed from the main part of the village and chances to be sufficiently free from local influences and accordingly yields the best analysis of any in the list. The Sampson well is also out some distance, but shows the local influence of stables,

if not privy. In many cases the low nitrites reveal that thus far nature has maintained a proper purification, so that unpurified organic matter is not yet directly reaching the wells. How long this state of affairs will continue cannot be foretold. The variations in the oxygen findings speak for some organic matter in some of the wells. The number of bacteria varied much, but fortunately intestinal bacteria do not, as yet, show in the water.

The analyses indicate that while none of the waters could be said to be capable of causing disease at the time of sampling, yet most of them show so much influence from sewage sources as to make them very undesirable for drinking purposes, and their continued use under present conditions may sooner or later lead to disaster.

It is evident that the future use of many of the Chardon well waters is a procedure to be viewed with some suspicion, and the time may not be far distant when the village will need to install a public water supply, or a system of sewers, or both. In the meantime, measures should be taken to stop, if possible, any further pollution of the wells by cesspools, vaults or privies with excreta deposited directly on the ground.

A copy of this report was furnished the health officer April 24, 1906, and his attention called to the condition of the wells examined and to the recommendation that efforts be made to prevent any further pollution of these. He was informed that should any considerable number of cases develop, the Board would be willing to make another investigation with the hope of determining the exact nature of the trouble.

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## REPORT ON THE WATER SUPPLY OF KELLEYS ISLAND WITH REFERENCE TO THE PREVALENCE OF TYPHOID FEVER.

On June 13, 1906, notice was received from the health officer of Kelley's Island, calling the attention of the Board to an unusual amount of typhoid fever, and requesting that an investigation be made.

The assistant engineer visited Kelleys Island on June 22, 1906, and the following report was made:

Kelleys Island is an incorporated village, occupying the whole of the island on which it is located and which has an area of about 2,800 acres. The topography of the island is mildly undulating and its geological formation consists of a very pure limestone rock overlaid by a thin layer of surface soil which does not exceed in thickness 15 feet at any place. The permanent population of the village is about 1,200, and this has remained practically constant, according to local authorities, for a great number of years. During the summer the population is increased by about 150 summer residents, nearly all of whom occupy



cottages. Very little is made of Kelleys Island as an excursion resort. The quarrying of limestone and the manufacture of quicklime has become a very great industry on the island. All of the quarries, of which there are three very large ones, are owned and operated by the Kelleys Island Lime & Transport Company. Another industry which has risen to considerable importance is the manufacture of wine and brandy, and practically the whole island is given over to the raising of grapes. The principal wine cellars on the island are those belonging to The Kelleys Island Wine Company and The Sweet Valley Wine Company. The village has, as yet, no paved streets, as the houses are too much scattered, but all the roads are macadamized and maintained in good condition.

Practically all the water used on the island is taken from Lake Erie, though there are several wells which are occasionally used, but, owing to the hardness of the water, are not very much in favor. The lake water is supplied to the island by four separate supply systems. Three of these belong to The Kelleys Island Lime & Transport Company, and the other to The Kelleys Island Dock & Steamboat Company. These different supplies will be described in detail below.

As yet the island has no system of sewerage and most of the closet and household wastes are discharged into cesspools. These cesspools are ordinarily constructed of limestone rock, laid in cement mortar. Many houses, however, especially those not connected to a water supply and those belonging to the workmen at the quarries and lime works, have merely the outdoor privy, poorly constructed, and in most cases, discharging directly on the surface of the ground.

#### WATER SUPPLY SYSTEMS.

*South Side Water Supply of The Kelleys Island Dock & Steamboat Company.* This supply is owned by The Kelleys Island Dock & Steamboat Company, and supplies the residence portion of the island. This water supply was first installed during the summer of 1893 by John D. Reinheimer, of Kelleys Island, and was owned and operated by him until a few years ago, when it was sold to the present owners. The supply, though installed just subsequent to the time that the State Board of Health was given supervision over the installation of new water supplies, was not submitted to the Board for approval. The works for pumping and distributing this supply are very crude, and may be described as follows: The intake is a 3-inch wrought-iron pipe, with 3 feet of the end perforated to act as a strainer. It is located on the west side of The Kelleys Island Dock & Steamboat Company's wharf and is within about 20 feet of the shore. About 40 feet farther out on the wharf, and discharging directly into the water is a public privy, used principally by patrons of two nearby saloons. The water is pumped,



during a few hours of each day, by means of a small power pump operated by a gasoline engine. The water is forced through a 2½-inch wrought main to a storage tank about one-half mile inland. This storage tank is of wooden construction, rests on a wooden tower 32 feet high to the bottom of the tank, and has a capacity of about 8,000 gallons. Laterals, connected with the main leading from the pumping station to the storage tank, extend to the east and west in the several streets which it crosses. These laterals are seldom more than an inch in diameter and supply from one to half a dozen houses each. In all there are 29 house connections, three of these being small-sized hotels. All the mains of the distributing system are laid on top of the ground and, in order to prevent freezing during winter months, they are disconnected at unions placed about 90 feet apart and the water allowed to drain out. Water for permanent residences during winter time is obtained from rain water cisterns or from tank wagons which deliver lake water to the various houses.

While the point at which this water supply is taken is undoubtedly subject to dangerous pollution, there is no record of typhoid being caused by its use.

*North Side Water Supply.* This supply is on the north side of the island and is used exclusively by the quarry operatives and their families. It is owned and operated by The Kelleys Island Lime & Transport Company. The water is taken from a point adjacent to one of the wharfs belonging to the company, and is pumped to a storage tank, from which it is distributed to the consumers by means of tank wagons. The intake pipe is 4 inches in diameter and of wrought iron, and draws from the northerly, inner corner of the main dock or cove very near the shore, as shown in the accompanying diagram. At this point there is practically no circulation of water, and it is stated by residents that floating particles have been seen to remain near the intake for several days at a time. Furthermore, large vessels used in the transportation of limestone are landed at this dock in such a manner that the stern, which, in nearly all cases, contains the privy, is directly over the intake pipe. It could not be ascertained during just what proportion of the time vessels lay at this dock, but it was generally conceded that they are there at least five days in a week. Conditions are somewhat further aggravated by the fact that the deposits on the lake bottom about the intake pipe are stirred up by the propellers of the steamers whenever they move out. An examination of the tank wagons was made, and, from all appearances, they seemed to be kept fairly clean. Water is carried to the various consumers and placed in barrels which are kept for that purpose. An examination of the interior of these barrels showed them to be fairly clean, but the general surroundings are such and, in many cases, light wooden covers for the barrels are so carelessly placed, that local contamination is easily possible. This water is also

delivered to two of the quarries, is placed in barrels with ice and used for drinking water by the quarrymen. It is among the consumers of this supply that all typhoid fever cases reported on the island have occurred. These will be discussed in detail below.

*West Side Water Supply.* This supply is also owned by The Kelleys Island Lime & Transport Company, and is very similar, in its operation, to the north side supply. The intake pipe takes its supply from the center of a rock-filled pier or wharf belonging to the company. This wharf is about 450 feet long and the intake pipe is about 100 feet from the end. It is claimed that a good current passes by this point, and the appearance of the water in the neighborhood would indicate this to be the case. The water, as in the case of the north side supply, is pumped to an elevated tank, from which the water is conveyed to the consumers in tank wagons. In this locality, however, there are very few homes of the quarrymen, and the principal use of the supply is for furnishing drinking water in the west side quarry. It is said that no typhoid fever has occurred among the users of this water. The supply is in some danger, however, from steamboats landing at the wharf, but the arrival of such steamers is not nearly as frequent as is the case at the dock, of the north side intake.

*South Side Water Supply of The Kelleys Island Lime & Transport Company.* This supply is taken, as in the case of the west side supply, from the center of a rock-filled wharf belonging to the company, and is pumped, as in the other case, to an elevated wooden tank near by. About 300 persons get water from this supply, most of whom are residents in cottages in this part of the island. A considerable quantity is also furnished to quarrymen who work a small quarry. This supply seems to be of fair quality, as there is considerable current by the wharf from which the supply is taken. The material used for filling in the wharf seems to act quite effectively as a strainer, for the water as seen in a glass is very free from suspended particles. Vessels are said to lie across the front of the wharf about one-half of the time, and they usually lie in such position that wastes discharged overboard are carried out into the lake.

*Typhoid Fever.* As above noted, all cases of typhoid fever occurred among the users of the north side supply belonging to the company, and all of these occurred within a very short time of each other. Following is a table of the cases reported by the resident physician:

## CASES OF TYPHOID FEVER, KELLEY'S ISLAND.

Name.	Age	Occupation.	Date taken sick.	Duration of illness.	Remarks.
Jesse Fiega. ....	50	Cooper .....	May 25, '06..	Convalescent.	Marked case.
John Keller....	28	Stoker .....	May 20, '06..	14 days ....	Mild case; all symptoms.
Geo. Carura ...	19	Laborer .....	May 25, '06..	25 days .....	Marked case.
Steve Fosekosh..	35	Quarryman ..	May 25, '06..	Convalescent	Marked case.
Andrew Robits. .	18	Quarryman ..	June 1, '06..	Still sick ...	Marked case.
Pete Wallert ..	14	None .....	June 7, '06..	Still sick ...	Marked case.
John Fortra....	23	Quarryman ..	June 1, '06..	Still sick ...	Marked case.
Joe Norwalk....	9	None .....	June 9, '06..	14 days .....	Mild, typical child's case.

In addition to these there was one other case, of which the details are unknown; patient was taken sick latter part of May and was taken to Marblehead for treatment. The exact nature of his sickness was not known, but it is believed to have been typhoid.

It will be noticed by referring to the above table that all of the cases occurred very closely together, so indicating a common source of infection. It is quite likely, therefore, that the water supply was polluted by a steamer lying at the dock about the time that the infection occurred. The milk supply was investigated for the purpose of finding out whether this had any bearing on the typhoid fever cases, but it was learned that all persons affected secured milk from different sources. Apparently no raw food, to the pollution of which typhoid is occasionally ascribed, was used. Taking all the evidence into consideration, and especially the fact that only the users of the one water supply were affected, it seems that the location of the north side intake furnishes the only reasonable explanation of this epidemic.

Inquiring into past history of typhoid in this section of the island, it was learned that eleven years ago another epidemic appeared, and was even more severe than the present one. This former epidemic had the same characteristics in every particular as the present one; that is to say, all the cases occurred at approximately the same time and all were among users of the north side water supply.

*Suggestions for Improving Conditions.* It was asked that suggestions be made by the State Board of Health as to the manner of improving conditions. From the rather brief investigation, it would seem that all the intakes, excepting that on the north side, should extend two or three hundred feet out into the lake. That on the north side should be relocated altogether, since it is in a cove where neither wind nor current can get at the water from which it draws its supply. The most feasible place for its relocation seems to be at a point just west of the quarry-

men's village and on the extreme north side of the island. The intake pipe should be run out at least several hundred feet, because just east of the location suggested a number of the workmen's tenements have privies discharging directly on the rock forming the shore line. This fecal matter undoubtedly flows or is washed into the lake and, under favorable conditions of wind, might be carried over the intake were it located too near the shore.

On October 25, 1906, the president and the chief engineer of the State Board of Health made an inspection of the water supply of Kelleys Island, this inspection being supplementary to those already made in 1906 by a member of the State Board of Health, and by the assistant engineer. The conditions described in the former report were found to be practically unchanged.

*The Kelleys Island Lime & Transport Company* owns and operates three supplies, known as the northerly, southerly and westerly supplies. The superintendent of this company was interviewed and showed a willingness to comply with any directions from the Board.

*The Kelleys Island Dock & Steamship Company*, described in the above report, was inspected. The superintendent of this company was interviewed and the necessity for extending the intake into the lake was explained to him. He appeared to be willing to comply with the directions of the Board.

In order to make the necessary improvements in the various water supplies of Kellys Island, the committee recommended that the following changes be made:

1. The Kelleys Island Lime & Transport Company should build a filter and purify all water taken from the vicinity of the north docks before delivering it to consumers. The filter plant should comply with the following general specifications:

- (a) A concrete box having an area of 400 square feet and a depth of 7 or 8 feet.

- (b) Three and one-half feet of sand underlaid by gravel.

- (c) A cast-iron or effluent pipe extending vertically, outside of the filter, to an elevation of 2 feet above the surface of the sand, at which elevation it should discharge into the filtered water basin.

- (d) A float valve for keeping the depth of water on the sand at about 3 feet.

- (e) A basin for filtered water. When this basin is full the level in it may be at the same elevation as the water on the filters, which arrangement will automatically stop filtration.

- (f) This plant may be placed at any convenient location, and plans for it should be submitted to the Board for criticism or approval before construction.



2. The southerly and westerly supplies of The Kelley's Island Lime & Transport Company should be protected by the enforcement of rules among all employes on boats tied to the southerly and westerly wharves. These rules should prohibit the use of closets on board the boats while these boats are attached to the wharves.

3. The Kelleys Island Dock & Steamboat Company should be required to extend its intake 500 feet into the lake in a southwesterly direction before any more water is used from this supply.

Up to January 1st, 1907, no plans have been submitted to the State Board of Health for approval.

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## REPORT OF AN INVESTIGATION OF TYPHOID FEVER AT MINSTER.

On November 9, 1906, the assistant engineer visited Minster for the purpose of investigating the prevalence of typhoid fever in that village. The investigation occupied two days, the most of the time being devoted to personally visiting the houses in which cases of typhoid occurred.

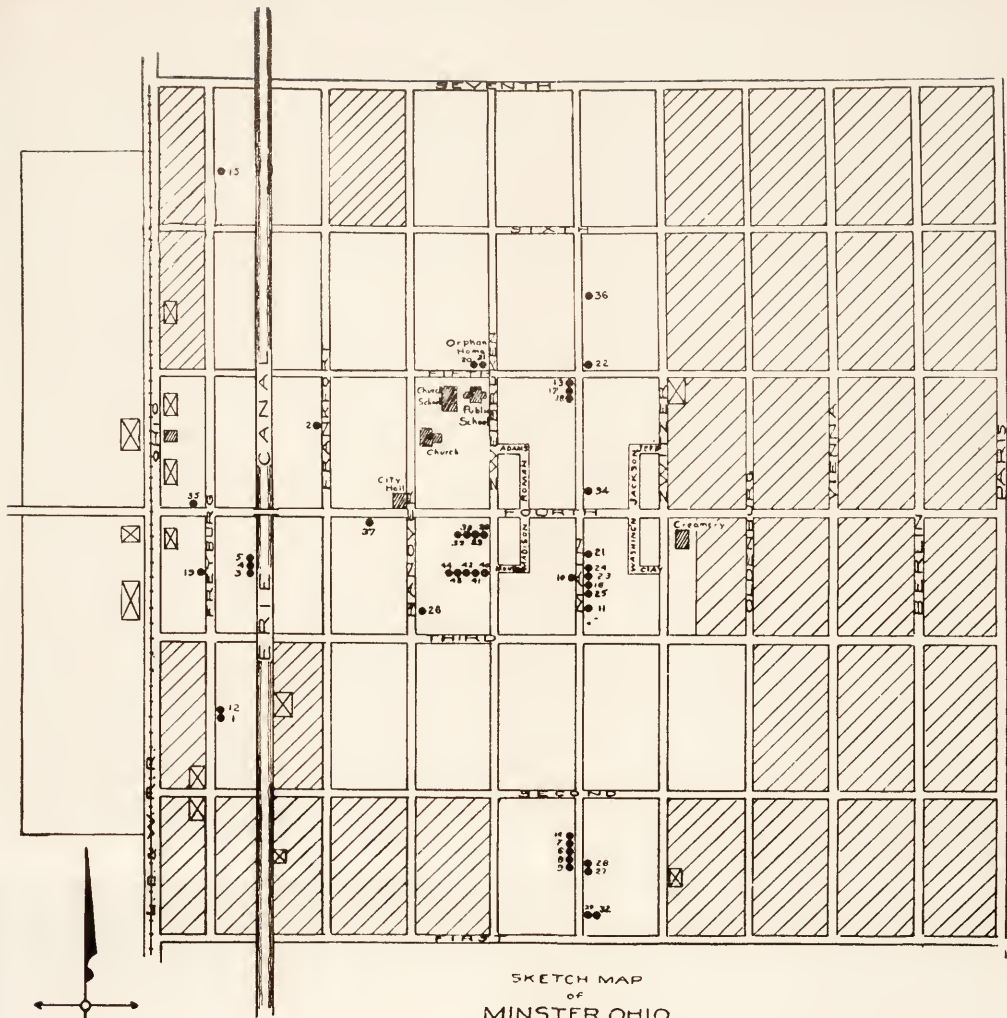
The following report was made:

The village of Minster is in the southwestern portion of Auglaize County on the Erie Canal, and has a population of about 1,500. The area of the village within the corporation limits is something over one square mile. The central portion of the village is thickly built up, but a large proportion of the incorporated area (indicated on map by cross-hatching) is still in open fields. The surrounding country is very flat and the natural drainage of the village has been impaired by the presence of the Erie Canal. An artificial waterway, unlike a natural waterway, under most conditions and especially during dry weather, feeds the underground water sources in its vicinity. It is on this account that many of the wells in Minster, especially those very near the canal, are supplied with more or less filtered canal water. Above Minster there is but little opportunity for large amounts of pollution to reach the canal, yet Dawson, twelve miles above, probably adds small quantities of domestic wastes. On the other hand, there are storm sewers and drains in Minster which receive privy overflows and no doubt add materially to the pollution of the canal. In addition to this it was stated that the contents of privy vaults are occasionally dumped into the canal.

The surface material or drift in this locality has a depth varying from about 80 feet in the northern part of the village to about 150 feet in the southern. The drift is composed principally of clay, though it contains strata of sand and gravel which serve as sources of water supply for shallow dug wells. It is not certain whether these sand and gravel layers are general or whether they form pockets. Judging from







SKETCH MAP  
OF  
MINSTER, OHIO  
showing  
LOCATION OF TYPHOID FEVER CASES  
OCCURRING BETWEEN JUNE 1 AND NOV 2, 1906  
Scale 1 in = 500 ft

● = Case of Typhoid Fever

June 1 to November 5, 1908

from

Typhoid Fever Cases

or

from showing Distention

September

August

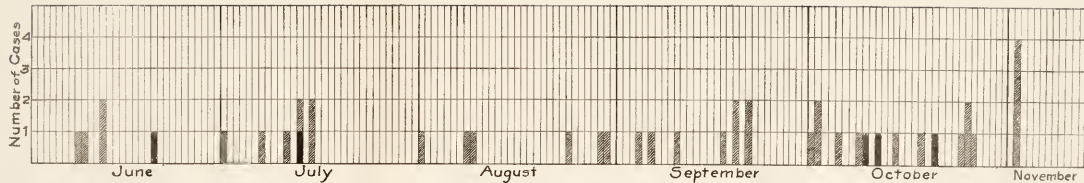


Diagram showing Distribution  
of  
Typhoid Fever Cases  
from

June 1 to November 2, 1906

Note: Solid Spaces show  
Fatal Cases of Typhoid

B-429

the abundant flow of water obtained from some of the shallow wells, they would appear at least to be large in extent. Below the drift lies Niagara limestone, which is said by a local well driller to have an irregular surface: In all parts of the village abundant water is found at or near the surface of the rock.

Minster is primarily a farming center, but it contains a creamery of considerable size and several cooperage works.

The village is provided with neither sewers nor a public water supply. Water for domestic purposes is generally obtained from sand and gravel in shallow dug wells seldom over 15 feet deep. Old fashioned privy vaults are universally used, and many of these are poorly constructed and infrequently cleaned. From appearances no thought is given to their location with reference to near-by wells and it is inevitable that many of the latter are polluted.

Minster has for a number of years suffered from an abnormally high typhoid fever death rate, especially in view of its size and generally healthful location. During the present year the village has had more typhoid fever than usual, there having been since June first 44 cases and 5 deaths. No records of typhoid fever deaths for previous years have been reported to the State Board of Health, nor are any available records kept by the local authorities. This is in direct violation of the law. [Section 2125 Revised Statutes.] Had typhoid fever statistics been properly reported to the State Board of Health, there is no doubt that the high morbidity rate would have been investigated long ago by the Board and recommendations would have been made, which if carried out would have saved many lives from this disease.

The object of the investigation was to locate if possible the cause or causes of the alarming spread of the disease. It was believed that this could best be accomplished if a practically complete list of cases, occurring since the prevalence began, could be obtained. Accordingly, the two local physicians were visited and a record obtained of the cases occurring since the first of June. The residence of each case was then visited personally; the person who had been ill or near relatives were questioned and a visual examination was made of the premises. The information sought was in general that contained in the following:

1. Attending physician.
2. Age.
3. Occupation.
4. Date taken sick and date of recovery or death.
5. History of patient during several months previous to illness, with special reference to *where* time was spent.
6. Water used for drinking purposes with description of well, including proximity of privies or other possible sources of pollution.
7. Milk supply — from whom obtained.
8. Quantity of raw oysters and raw vegetables, such as celery and lettuce, eaten by patient; also place where these were obtained.



9. Sanitary condition of premises, including note as to whether windows and doors were screened during summer.
10. Number of other persons in house.
11. Other cases in same house and neighborhood and among users of same water and food supplies.

Each case was recorded on a separate card. The cards were then numbered in the chronological order in which the cases occurred. The cases were plotted on the village map (which is herewith submitted), and are shown as black dots. The numbers correspond to the numbers on the cards and show the order in which the cases occurred. In order to show the distribution in point of time more plainly, a diagram was plotted showing graphically the dates on which cases occurred; this is also submitted.

It will be noted by referring to the map that all of the 44 cases recorded were distributed among 22 houses, as follows:

Two houses contained 5 cases each.

Two houses contained 4 cases each.

Two cases contained 3 cases each.

Four houses contained 2 cases each.

Twelve houses contained 1 case each.

Total of 22 houses. Total of 44 cases.

No cases were traceable to milk supplies, though it is quite likely, under conditions prevailing at Minster, that milk has at other times been the source of infection and may become so in the future. At the present time nearly all milk used in Minster is obtained from one dealer. In the family of this dealer there had been no typhoid nor was there a coincidence in point of time of a number of cases in different portions of the village, such as might be expected in a community having a widely used milk supply but no public water supply. On the contrary, the coincident cases were generally near together, and as noted in the preceding table, may have occurred coincidently in the same house. Of course, it is possible in the case of families owning a cow that the milk may have been infected by polluted water used in washing cans, by flies, or by a case of typhoid fever in the same house, but no strong evidence of infection occurring in this manner was found.

The matter of raw foods was inquired into, but no instances could be found where these seemed to be the probable source of infection. Raw oysters were practically never eaten and vegetables were generally grown in the family garden. It was found, too, that celery and lettuce (the most likely vegetable carriers of typhoid) were but little eaten.

In the great majority of cases and especially among those occurring two or more in the same house, the available evidence pointed strongly to the use of a shallow dug well as the cause of infection. Furthermore, in all cases these wells were located dangerously near to privies. There is no intention, however, to assign all cases of typhoid to polluted wells.

It is now generally recognized that in towns where the old fashioned outdoor privy still predominates a large amount of typhoid fever prevailing during the summer months may be due to infection by flies. These insects swarm about privies and from thence may fly to some open kitchen window, alighting on food in course of preparation and infect it with the fecal matter adhering to their feet. This manner of typhoid fever infection is perhaps the greatest argument in favor of the installation of a sanitary sewerage system. Quite apart from this is the convenience and general cleanliness which such a system brings about.

It was deemed advisable to secure analytical evidence of the quality of well waters used in Minster. Six wells were sampled, but the samples were unfortunately not delivered at the laboratory of the State Board of Health until six days later. After such a lapse of time the analyses are, of course, not reliable, but certain determinations were made as indicated in the accompanying report of the chemist and bacteriologist. The results of analyses will be referred to under the several cases discussed further on.

In order to obtain a clearer idea of the way in which typhoid infection spreads in Minster, the cases investigated may be examined in more detail.

By way of preface it may be said of all the cases about to be discussed that the infection was taken in Minster and that unless otherwise stated, the infection is most likely not attributable to milk or food.

*Case No. 1.* Male. Age 18. Sick three weeks. Typical walking typhoid. Used well water on premises and drank but little water elsewhere. Well is dug and but eight feet deep. Material pierced is loose soil near bank of Erie Canal. Privy is 60 feet distant and in fair state of repair. It is stated that in cleaning privy, contents are disposed of in the canal and in so doing are carted very near to the well. There was typhoid in this neighborhood during the previous year. This case was the first in this locality during the present year, and as the patient was at home nearly all the time, suspicion would attach to the immediate locality. It is probable that the well water is at fault, the well likely having been polluted from the top or by canal water insufficiently purified. Another case (No. 12) occurred in the same house, probably being infected from Case 1.

*Case No. 2.* Male. Age 24. Occupation, cigarmaker. Taken sick June 9th: confined for 52 days. No other persons in same house ill at same time or shortly before. No typhoid among friends. Drank water from shallow dug well back of house, belonging to a neighbor, and within 50 feet of canal. Within 20 to 40 feet are two privies. In house to which one privy belongs there had been typhoid during previous year. About this time Cases 3, 4 and 5 were visiting this neighbor and used the same well, though the condition of their own well would be sufficient to explain

cause of infection. Other members in family of Case 2 used a different well about 100 feet distant from that above described.

*Case No. 3.* Female. Age 26. Occupation, housewife. Taken sick June 12th; sick five weeks.

*Case No. 4.* Female. Age 5. At home. Taken sick June 12th; sick three weeks.

*Case No. 5.* Female. Age 3. At home. Taken sick June 20th.

The three cases above will be discussed together. The well used by the family is a shallow dug well within about 20 feet of the canal. The formation pierced is filled ground near canal and the water in the well is undoubtedly partially filtered canal water. It should be noted also, as above stated, that the family had drunk from the same well as Case 2. Cases 3 and 4 may have been contracted from this latter source. Case 5, occurring as it did about eight days later, was most likely contracted from the first two by personal contact in one form or another. Analysis of the well confirms the belief that it is subject to pollution.

*Case No. 6.* Female. Age 47. Occupation, housewife. Taken sick July 1st; sick four weeks. Visited the family in which Cases 3, 4 and 5 occurred, shortly before the latter were taken sick. The well used at the house in which Case 6 occurred is dug and 32 feet deep, water being struck at 13 feet. The top of the well is poorly protected and the privy is within 40 feet. In a field adjoining the house-lot, night soil is occasionally buried, and there is reason to believe this is imperfectly done. Numerous chickens run about the yard and may readily track fecal matter over the well. The analysis of the well water would indicate it to be of fair quality, though it is quite possible that it is often temporarily polluted by material falling in from the top. Other members of the family were taken sick with typhoid on July 7th, 11th and 13th, and August 8th (Cases 7, 8, 9 and 14). The fact that the occurrence of these later cases was not coincident though they followed each other closely, points rather to fly infection or infection by personal contact than to infection by water, though it may have been any one. There were two other cases of intestinal trouble in the same family that may have been mild typhoid.

*Case No. 7.* Male. Age 11. Taken sick July 7th; recovered August 8th. (See Case 6).

*Case No. 8.* Male. Age 9. Taken sick July 11th; recovered August 12th. (See Case 6).

*Case No. 9.* Female. Age 13. Taken sick July 13th; recovered August 12th. (See Case 6).

*Case No. 10.* Male. Age 26. Occupation, teamster. Taken sick July 13th; died July 27th. As family had moved from Minster, no definite information concerning the case could be obtained. At house in which patient lived water is supplied by a shallow dug well within 40 feet of a privy.

*Case No. 11.* Female. Age 5. Taken sick July 15th; recovered

August 10th. Only case in family of seven. Water at home obtained from a deep drilled well. Child played with children in neighboring house in which nearly the whole family shortly afterwards came down with typhoid fever. (See cases 16, 23, 24 and 25). The infection may have been due to drinking polluted water from neighbor's well or may have been due to personal contact.

*Case No. 12.* Male. Age 57. Occupation, potash manufacturer. Taken sick June 15th or 16th; was sick for six weeks. This case occurred in same house as Case 1 (which see) and was probably infected directly or indirectly by the same.

*Case No. 13.* Female. Age 55. Occupation, housewife. Taken sick August 1st; recovered September 10th. This was the first of three cases to occur in the same house. (Other cases Nos. 17 and 18). So far as could be learned the patient had not been near to other cases previously and had taken no food that might have carried the infection. The nearest case occurring before this one was about two blocks distant. However, after infection once entered the house it seems the well became polluted with typhoid dejecta, for it is a shallow dug well within 30 feet of the privy. Chemical analysis of the water corroborates the above. The other two cases occurred 29 and 32 days later, respectively.

*Case No. 14.* Male. Age 40. Occupation, carpenter. Taken sick August 8th; recovered September 14th. (See Case 6).

*Case No. 15.* Male. Age 15. Occupation, laborer in cooperage works. Taken sick August 9th; sick for three weeks. Only one in family that was ill. Conditions surrounding home are unsanitary, but infection was most likely not taken there. At the cooperage works a shallow dug well is used which is very poorly protected at the top. Two privies are within 100 feet of the well; a urinal is within 40 feet. The canal is about 50 feet distant. So far as is known there occurred no other cases of typhoid among employes at the works, but a number complained at time patient was taken sick, of bad colds and intestinal disturbances.

*Case No. 16.* Male. Age 17. Occupation, laborer at one of the cooperage works (not same as that at which Case 15 was employed). Taken sick August 24th; recovered September 23d. This was the first of four cases that occurred in the same house. (See Case 23, 24 and 25). There was also one other case of intestinal trouble not pronounced typhoid. The probable source of infection in this case could not be ascertained, though since patient was much about town and is said to have drunk considerable water, the opportunities for taking the disease were many. Water at the patient's home is obtained from a shallow dug well, imperfectly protected at the top and within about 60 feet of the privy. Analysis of the well water would indicate it to be of poor quality. The other cases in the same house may have been infected by personal contact with Case 16, or by flies. It should be noted that three other cases are traceable to



typhoid in this house, namely, No. 11 (already discussed) and Nos. 21 and 31 (which see).

*Case No. 17.* Female. Age 26. Occupation, clerk in general store adjoining residence. Taken sick about August 29th; recovered September 15th. (See Case 13).

*Case No. 18.* Female. Age 3. Taken sick August 30th; recovered September 15th. (See Case 13).

*Case No. 19.* Female. Age 8. Taken sick September 4th; recovered October 31st. This was the only case in the family and the source of infection could not be ascertained. The well used by family is a dug well 14 feet deep and within 60 feet of a privy 6 or 8 feet deep. The privy has not been cleaned for five years. Three years ago the whole family was taken down with typhoid. As there was but the one case this year, the well, though without doubt polluted, is probably not at fault. The child visited about the neighborhood, frequently going to the house where Cases 3, 4 and 5 occurred, and typhoid was probably contracted directly or indirectly from these.

*Case No. 20.* Female. Age 8. This girl lives at the orphanage where there are 52 children. The water supply is obtained from a deep drilled well and is most probably of good quality. There was but one other case (No. 31) in the institution, which was without doubt infected elsewhere. It is more than likely that this child also was infected elsewhere. Two weeks before taken sick the child went out with her father, and as far as could be learned, partook only of peanuts, candy and a milk shake; it was positively asserted that she came in contact with no other cases of typhoid and drank no water. The most probable source of infection would be the milk, though it is not certainly so.

*Case No. 21.* Female. Age 6. Taken sick September 10th; sick five weeks. This child was the only person sick with typhoid in a family of nine. The family obtained water from a deep drilled well. The little girl, however, played frequently with a child in a neighboring house in which Cases 16, 23, 24 and 25 occurred; furthermore, this was the only child in the house that visited these neighbors. The case would clearly seem to be due to personal contact or to drinking from the neighbor's polluted well.

*Case No. 22.* Female. Age 28. Occupation, housewife. Taken sick September 17th; recovered October 6th. Patient was the only one in family that took the fever. Though well used is a dug well and within 40 feet of a privy, it is not likely to have been the source of infection since it was used by a large number of persons. It would appear more probable that the disease was contracted at a neighboring house in which Cases 13, 17 and 18 occurred.

*Case No. 23.* Male. Aged 15. Taken sick September 19th; recovered October 15th. (See Case 16).



*Case No. 24.* Male. Age 12. Taken sick September 19th; recovered October 22d. (See Case 16).

*Case No. 25.* Female. Age 41. Occupation, housewife. Taken sick September 21st; confined for 22 days. (See Case 16).

*Case No. 26.* Female. Age 36. Occupation, housewife. Taken sick September 21st; recovered October 21st. This was the only case in the family. Patient was very careful about water used for drinking purposes, either drilled well water or Truckhoe lithia water being used. She was fond of celery and lettuce, most of which was obtained from St. Mary's and some of this may have been grown with human manure. Though the house is well screened during the summer time, the most likely explanation is that the patient was infected by flies from houses near by in which there was typhoid.

*Case No. 27.* Female. Age 8. Taken sick October 1st; recovered November 9th. Drinking water was obtained from a shallow dug well loosely boarded over. There are two privies within 50 and 100 feet of it. While this well may have been polluted, it is more probable that the infection was taken by drinking water at the next door neighbor's house, which water was obtained from the well at the house where Cases 6, 7, 8, 9 and 14 occurred. In the house of the next door neighbor there occurred several cases of intestinal diseases that were not pronounced typhoid. It is also possible that flies may have carried the infection from the house in which the five cases occurred. There are five other children in the same family but only the one was ill. However, the mother (Case 28) was taken sick with typhoid ten days later, a case probably due to personal contact.

*Case No. 28.* Female. Age 26. Occupation, housewife. Taken sick October 2d; recovered October 28th. (See case 27).

*Case No. 29.* Female. Aged 60. Taken sick October 2d; recovered October 31st. Patient was an invalid and remained constantly at home. Drank water from deep drilled well and ate no foods so far as is known that might have carried the typhoid infection. There are two ways in which the disease may be accounted for: The daughter (Case 32) had been attending a typhoid fever patient for three or four weeks before the mother was taken sick and may have imparted the disease in some way to her mother, either before or after she herself was infected. On the other hand, the infection may have been due to flies from one of two other houses in the neighborhood in which there had been typhoid. This latter possibility is strengthened when it is considered that during the few weeks previous to illness sorghum was being made on the premises, an operation which attracts great swarms of flies.

*Case No. 30.* Female. Age 12. Taken sick October 5th; confined four weeks. Well used for drinking purposes is a deep drilled well belonging to neighbors. Investigation brought out the fact that a shallow well very poorly protected at the top and within 75 feet of several privies

was occasionally used, especially by the children. This well is suspected of having been the cause of typhoid fever in previous years. All evidence points to this well as the source of infection, but no definite explanation of the manner in which the well became infected before the first case of sickness during the present year can be given. Case 30 was followed on October 11th by Case 33, and on October 25th by Cases 38 and 39, all in the same family. These subsequent cases may have been due to careless handling of the first case before a trained nurse was engaged.

*Case No. 31.* Female. Age 12. Taken sick October 8th; confined for three weeks. This is an interesting case as it occurred in the orphanage where there is every reason to believe the sanitary conditions, the water supply and food were above suspicion. Between two and three weeks before patient was taken sick she visited friends on Main Street next door to the house in which Cases 16, 23, 24 and 25 occurred. Absence from the orphanage was for a portion of the day only; during the time no food was eaten and water was drunk only at the above mentioned house. The water was obtained from a well within 75 feet of a privy containing typhoid discharges. The case is plainly one of water infection.

*Case No. 32.* Female. Age 25. Occupation, housewife. Taken sick October 9th; died October 24th. Patient attended a friend during typhoid fever illness and most likely contracted the disease by personal contact. There was one other case in the same family occurring a week earlier. (See Case 29).

*Case No. 33.* Male. Age 32. Occupation, janitor at public school building. Taken sick October 11th; died November 4th. (See Case 30).

*Case No. 34.* Male. Age 9. School boy at public school. Taken sick October 14th; convalescent at time of investigation. This was the only case in family. The well is a shallow dug well, but is over 100 feet from any privy. The fact that no other cases occurred in the same family renders it improbable that the well was the source of infection. Patient had been out of town on single day visits three weeks and ten days before being taken sick, but in neither case had he been near other typhoid fever cases. He was in the habit of playing in the neighborhood of the two houses in which Cases 30, 33, 38, 39 and 40, 41, 42 43 and 44 occurred, and more than likely (though no positive statement could be given by his mother) drank from the polluted well at one of the houses. See Case 40 for description of well.

*Case No. 35.* Female. Age 13. School girl. Taken sick October 18th; still sick at time of investigation. This was the only case in a family of eleven, and there had apparently been no typhoid in the house in recent years. Water for drinking purposes is obtained from an 8-foot well dug within 40 feet of the privy. The girl had been about town more or less, but her movements were not sufficiently well known to throw any light on the probable source of infection.

*Case No. 36.* Male. Age 42. Occupation, teamster. Taken sick

October 20th; died November 5th. Was only one in family or immediate neighborhood having typhoid during the present year. While the well from which drinking water is obtained is but 12 feet deep and within 50 feet of the privy, it is probably not the source of infection. The patient on account of his business went about town to a considerable extent and drank water from various sources. For about three weeks before being taken sick he was employed in hauling gravel along the canal bank and it is quite probable he drank from the well which is believed to have infected Case 1 and possibly Cases 3, 4 and 5.

*Case No. 37.* Male. Age 21. Occupation, barber. Taken sick about October 24th; still sick at time of investigation. This was the only case in the house or the immediate neighborhood. Patient drank water generally from a 40-foot drilled well, most likely in good condition, at the rear of the house. Occasionally he drank from a semi-public well near by, which, though drilled, is so poorly protected at the top that all manner of filth from the sidewalk may readily wash into it. It was stated on competent authority that at night persons coming from the saloon, in front of which the well is located, frequently committed nuisance about this well. It would, therefore, appear that it may have been infected. This well seems to be the most probable source of infection, though the case may be attributable to fly infection.

*Case No. 38.* Female. Age 30. Occupation, housewife. Taken sick October 25th; still sick at time of investigation. (See Case 30.)

*Case No. 39.* Male. Age 5. Taken sick October 25th; still sick at time of investigation. (See Case 30.)

*Case No. 40.* Male. Age 5. Taken sick October 26th; still sick at time of investigation. This case occurred next door to the house in which Cases 30, 33, 38 and 39 were confined and 21 days after Case 30 went to bed. It is one of five cases (Nos. 40, 41, 42, 43 and 44) in the same house, all the other cases occurring one week later. The well used by the family is a dug well 13 feet deep and within 30 feet of the privy containing all the typhoid discharges from the family next door. Furthermore, there is good reason to believe that these discharges were not disinfected during the early stages of sickness. As showing the influence of the privy on the well, it was stated that before cleaning the latter the water in the well tasted bad and had a foul odor resembling sewage. After cleaning, the taste and odor disappeared and the well was considered to again be safe. Analysis of the well water shows it to be of poor quality.

*Case No. 41.* Male. Age 3. Taken sick November 2nd; still sick at time of investigation. (See Case 40.)

*Case No. 42.* Female. Age 8. Taken sick November 2nd; still sick at time of investigation. (See Case 40.)

*Case No. 43.* Female. Age 12. Taken sick November 2nd; still sick at time of investigation. (See Case 40.)

*Case No. 44.* Male. Age 13. School boy. Taken sick November 2nd; still sick at time of investigation. (See Case 40.)

After a review of the above cases there is scarcely room left for doubt that all the cases about which fairly complete information was obtainable were due to the presence in the village of improperly constructed privy vaults and contaminated shallow wells. The complete remedy for the above is very evident; namely, the introduction of a pure public water supply and a well constructed system of sanitary sewers and the abolishment of all privies and polluted shallow wells. The cost of a water supply for Minster would be about \$15.00 per capita, or, assuming the population to be 1,500, a total of \$22,500.00. A sewer system, owing to local difficulties, would be expensive, but would scarcely exceed \$25,000.00. The total cost of the improvements would, therefore, be in the neighborhood of \$47,500.00.

The objection most likely to be raised against so large an expenditure is the high existing tax rate, namely, 47.2 mills for 1905, while the assessed valuation was but \$245,833.00 and the indebtedness \$13,050.00. The last figure represents cost of electric light plant, fire apparatus and street paving. On the other hand, such a remedy, while expensive, is not beyond the means of the village when the annual loss due to the prevalence of typhoid fever is considered. Taking the typhoid morbidity figures from June 1st of the present year to the time of the investigation, it will be seen that there were 44 cases and 5 deaths. Estimating the average cost of treatment of each case at \$100.00, which is a conservative figure including loss of wages, doctor bills and nursing, we have a total loss to the community of \$4,400.00. Add to this the cost of the five deaths at \$3,000.00 each (a figure generally accepted as a fair money valuation of the human life), we have \$4,400.00 plus \$15,000.00, or a total of \$19,400.00. Assuming this last figure to equal the average annual loss due to present unsanitary conditions (a conservative assumption, as the figures cover but six months of the present year), and estimating the cost of the water-works and sewerage system as above at \$47,500.00, it will be seen that the saving from sickness and death for typhoid alone will pay for the improvements outlined in 2.45 years. Furthermore, there can be no doubt that the unsanitary conditions prevailing at Minster are responsible for sickness if not death from other diseases also, more especially intestinal troubles.

It might be suggested that the difficulty of a high tax rate and limit of indebtedness might be overcome by increasing the assessed valuation.

After all has been said on the advisability of installing a proper water supply and sewerage system, it must be recognized that immediate steps should be taken to prevent the recurrence of typhoid to such an alarming extent. This may be done by the local health board, which has full authority to close all of the dangerously located shallow wells and cause to be reconstructed all privies so that they will not be a source



of pollution to the ground water or serve as points from which infection may be carried by flies. To accomplish the closing of wells a competent sanitary chemist should be engaged to make analyses of the suspicious well waters, and if they prove liable to pollution they should be immediately filled in. The reconstruction of the privies should be in accordance with the following or similar rules, which should be enforced with absolute strictness.

*Rules for Construction of Privies.*

1. All privies should be provided with *water-tight* receptacles resting *at or above* the surface of the ground and so placed that all fecal matter is discharged into them.
2. The receptacles in which fecal matter is contained shall be entirely enclosed in a suitable compartment under the seats which will *prevent the admission of flies*, but shall be so constructed as to be readily accessible for *inspection* and the *removal of receptacles*.
3. All seats shall be provided with *hinged covers which will not remain open* unless held open.
4. An ample supply of powdered slaked lime shall be accessible for sprinkling over the fecal matter after each use of the privy.
5. As soon as *full*, receptacles shall be emptied and the material *removed at least one-fourth of a mile* beyond the city limits and buried in the ground.
6. It shall be the duty of the health officer or his representatives to inspect all privies *not less frequently than once in two months* and to prosecute persons found not complying with the above rules.

It was noted during the investigation that there is considerable laxity in enforcing the rules of the local board of health, primarily for fear of giving personal offense. Unless this policy is discarded for the strictest enforcement of sanitary regulations, the village of Minster will continue to suffer from typhoid and perhaps other contagious and infectious diseases.

CONCLUSIONS.

The substance of the foregoing report may be summed up in the following conclusions:

- 1st. That the village of Minster is and has been suffering for a number of years from a very high morbidity rate of typhoid fever;
- 2nd. That the disease is due almost wholly to the presence of improperly constructed privy vaults and shallow polluted wells;
- 3rd. That the typhoid fever morbidity can be most effectively reduced by the installation of a pure public water supply and a properly constructed sanitary sewerage system;
- 4th. That temporary measures for reducing typhoid fever morbidity, consisting in the filling up of all polluted wells and the reconstruction of all privies, should be instituted at once; and,



5th. That more accurate vital statistics should be kept by the local health authorities, these to be reported regularly to the State Board of Health.

December 15, 1906, a copy of this report was sent to the health officer of Minster and he was urged to adopt the rules and regulations governing the construction and cleaning of privies. He was also advised that dry powdered earth might be used at least a part of the time in place of the powdered slaked lime. The report was also furnished the mayor and the hope expressed that he would assist the health officer in carrying out the recommendations of the report.

Attention was called to the need of a new water supply and sewerage system in order to give the village permanent relief.

### REPORT ON EXAMINATION OF WATERS FROM MINSTER.

PARTS PER MILLION.

Source of sample.....	Clune well on Frey- burg St. near canal	Wilkins well on Swei- brucken St.	Vanoss well on Swei- brucken St.	Neinburg well on Main St.
Number of sample.....	6129	6130	6131	6147
Color .....	.....	.....	.....	.....
Oxygen required.....	2.53	1.94	4.11	1.11
N. { Nitrites .....	.....	.....	.....	.....
as { Nitrates .....	8.0	8.0	6.0	24.0
Chlorine .....	79.4	91.6	124.4	284.0
Number of bacteria per cc....	4900	15,770	6700	8910
Colon bacilli present.....	not in 50cc.	not in 50cc.	not in 60cc.	not in 50cc.

Source of sample.....	Otting well on Main St.	B. Feltman well on Main Street
Number of sample.....	6148	6149
Oxygen required .....	3.05	.44
N. { Nitrites .....	.....	.....
as { Nitrates .....	16.0	none
Chlorine .....	106.0	46.0
No. of bacteria per c.c.....	184000.	775.
Colon bacilli present.....	not in 50c.c.	not in 50c.c.

These samples were collected on November 10th, but not received at the laboratory until the 16th.

Examination was requested for nitrates and the number of bacteria. Some other determinations were added in hopes to throw light upon the quality of the waters, although practically all analytical determinations to determine the organic purity of the water are valueless after such a lapse of time. Especially is the number of bacteria without value in waters that have stood six days, and it would be manifestly unfair to place any value in a high count under these circumstances. A low count, on the other hand, might receive some consideration.

The chlorine determinations would not change on standing, and are, therefore, reliable, but, unfortunately, these samples come from a territory where salt influences prevail, and the increase in chlorides due to mineral salt is such as to mask any sewage influence. Most of the chlorides exceed those of sewages. The presence of nitrates in five of the samples is an undesirable feature, but without the ammonias and nitrites and with the chlorides masked as stated above, information is wanting as to whether nature has given a complete purification. The analytical findings of the first five samples would place the waters under suspicion had the findings been obtained on fresh samples, but with the known possibilities of error one is not warranted in basing a definite opinion upon the analyses.

In the case of the sixth water, namely, 6,149 from B. Feltman well on Main Street, the analytical findings are such as to indicate a usable water.

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#### REPORT ON PREVALENCE OF TYPHOID FEVER IN YOUNGSTOWN, OHIO, WITH SPECIAL REFERENCE TO THE INFLUENCE PRODUCED BY THE FILTRATION OF THE PUBLIC WATER SUPPLY.

Reports were received of a considerable outbreak of typhoid fever in the city of Youngstown. As a water purification plant had been recently put in operation for this city, and as many believed that it was owing to the failure of this plant to properly purify the water that typhoid fever cases were due, the Board deemed it advisable to make a thorough investigation of the outbreak to determine this point.

The assistant engineer was detailed to make this investigation and was instructed to determine in so far as possible the origin of each case.

Following is his report:

The city of Youngstown is on the Mahoning River and has a population at the present time of about 60,000. The area of the city within the corporation limits is about 2.5 square miles. That portion of the town in which the industrial plants and the business district lie is from 25 to 40 feet above the river, is fairly flat and is composed of drift deposits. These low lands are in no place more than one-half mile wide and generally much narrower. The valley is enclosed on both sides of the river by rather steep slopes. These slopes are composed mainly of sandrock and shale, both much fractured and permitting the ready passage of ground water. The drift in the valley is of considerable depth: in places solid rock is not reached at 70 to 80 feet below the surface level.

The manufacture of steel and iron and its products is by far the most important industry, and in it a very large proportion of the pop-

ulation is engaged. Many of the mill laborers are foreigners and live in cheap houses in unsanitary neighborhoods, a matter which will be referred to again.

Youngstown for a number of years has suffered from a high typhoid fever death rate, although the general death rate has been below the average. It has been generally believed that the public water supply was the prime cause of the excessive amount of typhoid, though it was recognized by some that other causes were also operative. Table No. 1 gives the vital statistics for Youngstown during the last thirteen years, with special reference to the typhoid fever death rate. In Table No. 2 the total death rates and death rates from typhoid are given for seven large cities of Ohio, in comparison with the same figures for Youngstown. It will be noted that Youngstown has the highest death rate from typhoid and that deaths from typhoid constitute a larger percentage of all deaths than in any of the other cities.

TABLE NO. 1.

VITAL STATISTICS FOR YOUNGSTOWN WITH SPECIAL REFERENCE TO THE TYPHOID FEVER DEATH RATE.

Year.	Population.	Total Deaths from All Causes.	Total Deaths per 100,000 Population.	Deaths from Typhoid Fever.	Deaths from Typhoid per 100,000 Population.
1893 .....	36,700	516	1405	8	21.8
1894 .....	37,900	503	1330	13	34.3
1895 .....	39,000	543	1390	11	28.2
1896 .....	40,200	452	1123	22	54.7
1897 .....	41,400	463	1260	20	48.3
1898 .....	42,500	527	1240	28	66.0
1899 .....	43,700	664	1520	54	123.5
1900 .....	44,900	603	1340	39	87.0
1901 .....	47,400	701	1480	59	124.2
1902 .....	49,900	763	1530	59	118.0
1903 .....	52,400	842	1605	79	150.6
1904 .....	55,000	949	1725	44	80.0
1905 .....	57,500	969	1685	30	52.2

TABLE NO. 2.  
VITAL STATISTICS OF OHIO CITIES.

City	Period Covered in Years.	Total Death Rate per 100,000.	Typhoid Death per 100,000.	Per cent. Rate Typhoid of All Deaths.
Canton .....	1890—1904	1102	42	3.8
Cincinnati .....	1890—1904	1928	51	2.6
Columbus .....	1890—1904	1344	48	3.6
Dayton .....	1890—1904	1487	31	2.1
Lima .....	1890—1904	1438	39	2.7
Springfield .....	1890—1904	1347	45	3.3
Toledo .....	1890—1904	1405	32	2.3
Youngstown .....	1893—1905	1433	76	5.3

Until 1905 the public water supply was drawn directly from the Mahoning River. The river at this point is seriously polluted by sewage from Warren, Niles and Girard. In addition to this, the entire flow of the river is used over and over again by a number of steel plants. At the water-works intake the river has a very uninviting appearance as a potable water, being greatly discolored after its use in the steel mills and having usually an oily film on the surface. In 1905 a mechanical filter plant was installed and was placed in operation August 25th. Regular records of the operation of the filter plant were not kept until March 12, 1906. Since that date the chemist and bacteriologist in charge has maintained regular daily analytical records of the raw and filtered water. The average monthly results are given in Appendix VI. It will be noted that the efficiencies have always been high and compare favorably with the results obtained from other filter plants throughout the country.

It is not the purpose of this report to discuss the problem of filtration. The State Board of Health is at present studying the operation of the Youngstown filter plant in connection with a special investigation of filter plants throughout the state, the results of which will be published during the following year.

To the sanitarian a very striking feature of Youngstown is the large number of shallow wells and old-fashioned vault privies still in use throughout thickly built-up portions of the city. The existence of the first is no doubt due to a general distrust of the public water supply, and the latter to the fact that no ordinance has ever been enacted making it compulsory on city property owners to connect with the city sewers.

## OBJECT OF INVESTIGATION.

The object of the investigation about to be discussed was to ascertain: (1) Whether or not the obtainable evidence indicates the public water supply to be a source of typhoid fever infection; and (2) to learn as far as possible what are the *prevailing* sources of typhoid infection in Youngstown, if other than the public water supply.

## METHODS PURSUED DURING INVESTIGATION.

Before going into the methods pursued during the investigation, it will be well to give briefly by way of preface the generally accepted facts about the typhoid germ and typhoid fever. *Bacillus typhosus* is a short rod-shaped bacterium finding its favorite environment in the human intestines. Unlike certain other bacteria, it forms no spores; that is to say, it does not surround itself with a tough shell, in which condition it may resist great variation in temperature and absence of moisture. Comparatively speaking, it is a frail organism and soon succumbs to extremes of heat and cold. More hardy individuals, however, are able to live for weeks, and possibly months, in streams or lakes. Even when frozen in ice, some of them may exist for several months; this, however, refers only to pure cultures having the germ present originally in great numbers. The practical danger from ice does not need to be taken into consideration. In fecal matter, as in a privy vault, the typhoid bacillus may exist for a great length of time, since food material and moisture are abundant and considerable heat is furnished by the process of decomposition. The germ probably succumbs more readily to lack of moisture than any other cause; hence, typhoid fever is a disease not likely to be contracted by breathing infected dust, i. e., it is not a so-called contagious disease. It is now quite well established that the typhoid infection must take place through the mouth; in other words, to have typhoid the germs must actually be swallowed. This may be brought about in innumerable ways, but the last step is always the eating or drinking of some infected food.

Typhoid fever being an intestinal disease, the discharges of a typhoid patient contain the germs in very great numbers; hence the danger of pollution of public water supplies by sewage. Unfortunately, bacteriologists have as yet been unable to detect the typhoid bacteria in water with any certainty, and the only means we have of knowing whether or not a water supply is liable to cause typhoid fever are indirect. The presence in considerable numbers of the colon bacillus, a hardy though harmless intestinal germ which lives for long periods in unfavorable environments and which can be readily detected by analytical methods, is taken as proof of sewage contamination. In a water so contaminated, typhoid fever is an ever-present danger. Chemical analyses are also invoked in determining the purity of a water. The results so obtained indicate in a gen-



eral way the extent to which polluting substances have been made harmless by mineralization and also act as a check on the bacteriological results.

Milk is also a great carrier of the typhoid germ. Being rich in food material it acts as a culture medium for the germs when once inoculated with them. The opportunities for the infection of milk are many in the great majority of dairies as conducted at the present time. Infected milk and water are the most striking causes of typhoid infection, since they usually cause sharp epidemics which in the case of a polluted water supply may be of appalling magnitude.

On the other hand, there is a large amount of typhoid that is not of the epidemic sort and from which (as variously estimated for the United States) fifteen to twenty persons per 100,000 population die annually. For certain localities the figure may be considerably smaller or larger than the above. A bad water supply may increase the rate in some cities by three hundred to five hundred per cent, thus obscuring the residual typhoid. Nevertheless, the latter is frequently large in amount and has to a certain extent, owing to its insidious character, been overlooked by sanitarians. For this residual typhoid Sedgwick has suggested the name of "prosodemic" typhoid, meaning through or among the people, in contradistinction to "endemic," meaning due to natural causes peculiar to a certain locality, and "epidemic," referring to a spread of the disease by a single source of infection reaching a number of persons at once. Prosodemic typhoid from its nature may be disseminated in innumerable ways, but is more frequently found in slum districts, where the habits of the people are uncleanly, or in districts where there is no adequate sewerage. Under such conditions infection may readily take place from the careless handling of food and from polluted wells contaminated by leaching cesspools and privy vaults. In addition, sporadic cases, which must be classed under the head of prosodemic typhoid, may be obtained from eating raw oysters fattened near some sewer outlet or from celery and lettuce grown with human manure. From the foregoing, it will be readily understood that when dealing with prosodemic typhoid it is very difficult and frequently impossible to discover the cause of specific infections.

Having reviewed the general character of the disease, the methods of making the investigation may next be taken up.

The first step in the investigation was to examine and carefully record all cases of typhoid fever that had been reported to the Youngstown health department since the first of January, or about the time the filter plant was supposed to be in successful operation. Each case was recorded on a separate card, on which all information subsequently obtained was also recorded. The cases were then plotted on a city map, in the hope that their distribution might indicate the probable source of

infection. They were found to be fairly well scattered, with here and there a group. Those cases composing the groups were not frequently coincident in time, and on the whole the map gave no reliable indication of what was sought. It was, therefore, decided at the outset to visit all cases in person, making an examination of the premises and obtaining as much information as possible by questioning the patient, relatives or neighbors. In this connection the following data were always recorded when obtainable:

1. Name.
2. Address.
3. Attending physician and place of confinement.
4. Age.
5. Sex.
6. Occupation and place of business.
7. Date taken sick and date of recovery or death.
8. Water used for drinking.
9. Quantity of milk used and from whom purchased.
10. Quantity of raw foods eaten that might have carried typhoid infection, such as celery, lettuce and raw oysters; ice-cream was also included.
11. Sanitary condition of house and premises.
12. Whether or not residence connected with sewers.
13. Whether or not residence connected with public water supply.
14. Whether or not windows and doors are screened during summer.
15. History of patient during several months previous to illness, with special reference to where time was spent.
16. Disposal of discharges during illness.
17. Disinfection during illness.
18. Peculiarities of case, such as mildness or severity and complications.

It is believed that the information so obtained would be of far more value and the inferences drawn from them far more conclusive if a practically complete list of cases could be obtained. Something less than half were reported by physicians. Accordingly, a circular letter (see Appendix V) was sent on September 12th to all physicians in the city having a general practice. This letter requested a complete list of all cases treated during the year, together with such other information as would throw light on the probable source of infection. Within ten days after this letter was written only eight replies were received out of the ninety-eight physicians written to. On September 24th another circular letter (see Appendix V) was sent out asking for the information previously requested, or at least the name, address and period of illness. Within two weeks after this letter was sent thirty more replies were received. From this time until the end of the investigation ten more replies were received, making in all forty-eight replies by letter. An attempt was then made to reach all the other physicians by telephone and a few personal calls were also made. In this way nearly all the required information was obtained.

Visiting the various cases consumed the bulk of the time during the investigation and was made more difficult for the reason that much of the ground had to be traversed several times owing to the slowness with which the physicians responded.

After nearly all the cases had been visited, samples were collected from a number of wells for chemical and bacterial analysis (see Appendix III). These wells were not selected so much for the purpose of proving them the cause of specific infections as to indicate the character of well waters in general use and the possibility of their becoming sources of infection. To accomplish the former would have required analyzing over a hundred well waters at great expense, without adding materially to the value of the data otherwise obtained.

#### RESULTS FROM DATA COLLECTED DURING INVESTIGATION.

As previously indicated, unless typhoid fever can be definitely traced to a common source of infection, it is practically impossible to ascertain the cause of specific cases, but a summing up of the detailed data may show very clearly in which direction the weight of evidence points.

Accordingly, the mass of detailed information contained in Appendices I and II was gone over with great care and the following figures obtained. Total number of cases reported, 208. Number of cases infected in Youngstown, 153. For distribution of these with reference to date of occurrence see Diagram I; for distribution about the city see appended map. Number of cases infected elsewhere and brought to Youngstown for treatment, 36 or 17.3 per cent of the total. Number of cases which could not be found and about whom no reliable information could be obtained, 13. Number of cases in which no one could be found at home after several visits, 3. Number of cases reported too late to be investigated, 3.

Of the 153 cases that were infected in Youngstown, the following information was worked out.

Number of cases living in houses not connected with the public water supply, 93 or 60 per cent.

Number of cases living in houses not connected with the city sewers, 95 or 62 per cent.

Number of cases claiming to use well water only, 109 or 71.3 per cent.

Number of cases claiming to use both the public water supply and well water, 43 or 28.1 per cent.

Number of cases claiming to use city water only, 1.

Number of cases working in steel mills, 28 or 18.3 per cent.

Number of cases in houses with poor sanitary conditions, 64 or 41.8 per cent.

Number of cases in houses with fair sanitary conditions, 52 or 34 per cent.

Number of cases in houses with good sanitary conditions, 37 or 24.2 per cent.

These last three items involve largely the personal equation of the writer, though it is believed his judgment will correspond with that of

the average sanitarian. By bad sanitary condition is meant a condition which fails to show that any attempt is made to maintain cleanliness and neatness. In these cases the houses are dilapidated and smeared with dirt and grease, while the yards are generally bare of vegetation and strewn with refuse of various sorts. By fair sanitary condition is meant that condition which shows that an effort is made toward cleanliness and neatness, while there are still signs of slovenliness. By good sanitary condition is meant the condition one expects to find in a well regulated household.

During the investigation, inquiries were always made regarding the source of milk supply and places where food to be eaten raw was procured. Such information did not indicate the likelihood of these articles being the source of infection, since there were no coincidences in the cases among persons securing supplies at the same place.

Somewhat aside from the main objects of the investigation the following table has been prepared, showing the distribution of the 153 cases by sex and age. The number of fatalities was 17 or 11.1 per cent.; this figure may have been increased by some of the cases dying subsequent to the investigation.

TABLE NO. 3.  
AGES OF TYPHOID FEVER PATIENTS INFECTED IN YOUNGSTOWN.

Age Periods.	Male.	Female.	Total.	Per cent. of Total.
0-4 .....	4	4	8	5.2
5-9 .....	9	9	18	11.8
10-14 .....	10	12	22	14.4
15-19 .....	18	5	23	15.0
20-24 .....	19	11	30	19.6
25-29 .....	12	8	20	13.1
30-34 .....	12	5	17	11.1
35-39 .....	3	1	4	2.6
40-44 .....	3	3	6	3.9
45-49 .....	2	1	3	2.0
50-59 .....	1	1	2	1.3
Over 60 .....				
Totals .....	93	60	153	100

In reviewing the figures deduced from information obtained concerning the 153 cases infected in Youngstown, it will be seen that they



throw the greatest suspicion on well waters. Furthermore, an examination of the detailed information (see Appendix I) will show that all but a very few of the wells are located dangerously near to privies. But even so, all typhoid occurring in the city cannot be laid to wells, for in a number of instances it would seem impossible for them to have become dangerously polluted. Several instances were found where the most reasonable explanation of the infection would be that flies had carried matter on their feet from some privy to a nearby kitchen and there polluted food being prepared for the table. The careless and open construction of many privies lends great strength to this hypothesis. In addition, there were also cases of infection by personal contact or the washing of infected clothes, forming of course a link in the process of food infection. (See Appendix I, cases 92 and 93.) Three cases (Nos. 75, 135 and 138) among boys were most likely contracted by bathing in sewage polluted streams. There were seventeen cases in houses supplied with city water that claimed to use well water only. In all these cases the statement was emphatic.

In just one case (No. 16, Appendix I) was the claim made that city water was used exclusively. There were two other cases (Nos. 24 and 25) in which infection from other causes than the public water supply seemed improbable. All of these cases occurred before the plant was placed under its present management and before regular analytical records of the efficiency of the filters were kept. It is, of course, impossible to state definitely whether or not these cases were infected from filtered water, though it is not improbable. It has been found from examinations of the filtration plant made by the State Board of Health that at least two grains of alum per gallon of water filtered are necessary for the attainment of high efficiencies. At the time the three cases occurred considerably less than this was being used. The fact that these cases may be attributable to the filtered water emphasizes the necessity for the most intelligent management of the filter plant and the maintenance of rigid control by frequent analyses of the treated and untreated water.

It might not be out of place here definitely to state that under nearly all conditions there is enough alkalinity in the unfiltered water to completely decompose all the alum. As it is a general belief that alum is frequently perceptible to the taste in the filtered water, it may be added that the average person cannot by taste detect so great a quantity as eight grains of alum per gallon of water, an amount greater than is ever used in actual practice. Furthermore, there is no excuse in the operation of the filters for permitting *any* undecomposed alum or the precipitated aluminum hydrate to pass into the filtered water.

A very striking feature of the figures is the great number of cases that occurred in houses where the sanitary conditions were poor or only fair, showing that dirt is a promoter of typhoid infection. As previously indicated, one of the most notable features of the sanitary condition of



Youngstown is the exceedingly great number of old fashioned privies in use, even though the city is comparatively well sewered. To make matters much worse, the universal prejudice against the public water supply has caused the use of hundreds of shallow dug wells, nearly all of which are but 20 to 100 feet from privies. Such conditions invariably lead to an increase in typhoid as evidenced by the experience of the city of Baltimore during a long term of years. The city of Springfield, Massachusetts, has had a similar experience which was well brought out in a small typhoid epidemic during the summer of 1905, described by Mr. E. E. Lockridge, Engineer of the Water Board, before the New England Water Works Association in March, 1906. It was found that a few cases infected in a district peopled by a foreign population living under most unsanitary conditions were rapidly followed by numerous other cases. For sometime the disease was confined to the unsanitary houses, but by and by isolated cases occurred in the better residence districts, showing that an entire community is to a certain extent influenced by its worst portions. These are precisely the conditions that prevail through the summer months in Youngstown, with its large population of foreign born laborers.

#### RESULTS FROM WATER ANALYSES.

(For analyses in full with discussion of each sample, see Appendix IV.)

In order to obtain analytical evidence on the condition of wells about the city, numerous samples of well water were collected and submitted to chemical and bacterial analysis. In choosing wells to be sampled, representative wells, which were the apparent cause of typhoid infection, were taken. They were also selected far removed from each other and are intended to cover the widest range of conditions. The wells sampled may be discussed under the heads of private wells, public wells and wells at industrial plants. Seven samples (Nos. 1, 2, 3, 4, 5, 6 and 7) were collected from private wells. Of these all but one (No. 5) showed the presence of appreciable quantities of nitrites; all showed excessive nitrates, oxygen required and chlorine. Chlorine in this region is not a certain index of sewage pollution since the substrata contain considerable natural chlorine, but when used comparatively with other analyses in the same locality it is significant. Albuminoid ammonia and free ammonia are generally high, though in some cases they are reasonably low. The low ammonias, however, are always accompanied with high nitrates and with some nitrites (excepting in Sample 5, as noted, which contains no nitrites). Hence, the absence of considerable ammonias indicates that pollution was remote and that at time of sampling no fresh pollution was entering the well. The bacterial content is generally high and in most cases excessive for well waters. In all cases one cubic centimeter of the water produced gas in dextrose tubes and gave the typical absorption

test for the colon bacillus. In two wells the complete confirmative test showed the colon bacillus to be present. From the above statements it will be seen that all of the wells show marked evidences of injurious pollution. In some the pollution is very recent, while in others it is more remote leaving only the nitrates, nitrites, oxygen consumed and numerous bacteria to indicate the danger. Though some of these wells were safe for drinking purposes at time of examination, the analyses make it plain that pollution had existed and inspection of the premises shows that the polluting influences are still the same and may at any time reinfect the wells.

Four samples (Nos. 8, 9, 10 and 11) were taken from public wells. No. 8, the Rayen Avenue School well, showed the effect of past polluting influences, but at time of examination a fair degree of purification had been effected. No. 9, the Wheeler Spring, is indicated to have suffered from some polluting influence, but the low number of bacteria would indicate that rather thorough filtration had taken place. This water should be frequently analyzed to detect any deterioration. No. 10 gives the analysis of a sample taken from the well in the public square. This is in the very heart of the city and the water is used by a very large number of people. The presence of considerable amounts of nitrites, nitrates and chlorine, the high number of bacteria, and the presence of the colon bacillus all indicate the influence of dangerous pollution. The comparatively low oxygen required and ammonias show that the pollution was not recent in point of time and that the water has undergone partial purification. This well is practically surrounded by large sewers, which fact amply explains the analytical evidence of pollution. As long as this well exists it will be a menace to public health. That this well has been the cause of some typhoid fever is entirely possible, though no specific cases were traced to it during the present year. No. 11 is a well belonging to St. Columba's School. It was sampled on account of the coincidence of several cases of typhoid among users of the water. It appears from the analysis that the water is of good sanitary quality and shows only slight evidence of contamination in the rather high number of bacteria. An analysis of this well during a period of rainy weather would be desirable, as there is then liable to be a more rapid movement of the ground water in this locality and a correspondingly smaller chance for adequate purification.

Twelve samples (Nos. 12 to 23, inclusive) were collected from wells used for drinking purposes at the various industrial plants in and near the city. Of these, six (Nos. 12, 14, 16, 18, 19 and 21) were analyzed for bacteria only. Of the thirteen, five showed marked evidence of injurious contamination. There were twenty-eight cases among mill operatives living in Youngstown and it seems quite likely that some of them at least were contracted at the works. While, as noted, some of the wells are in poor condition, the source of infection is quite as likely raw river

water which is piped to all parts of many of the plants for cooling purposes. It was found in these plants that some of the men (usually foreigners) will occasionally drink this cooling water, notwithstanding that well water is carried to all employes by water boys.

The general inference from the analyses, combined with an inspection of a large number of additional wells, is that many private wells are dangerously polluted, that a number of public and semi-public wells should be regarded with suspicion, and that several wells at industrial plants may be responsible for typhoid fever. It would be highly desirable for the local authorities to appropriate a sufficient sum to make possible the analysis of a large number of wells throughout the city and all those showing signs of danger should be at once closed.

#### RESULTS FROM STATISTICAL STUDIES.

Certain statistical studies were made of typhoid in Youngstown for the purpose of throwing further light on the probable cause of infection. From Table No. 1 it will be seen that the total death rate is fairly low, whereas the typhoid fever death rate is abnormally high. The death rate from typhoid is better shown in Diagram II. It will be seen that the rate beginning with 1893 is very low and this increases rapidly though with more or less irregularity until 1903 is reached, during which year there was the extremely high death rate of 150.6 per 100,000, a figure exceeded by but a very few cities in the country. From 1903 to the present year there has been a rapid decline in the curve. The estimated death rate for 1906 is 42 per 100,000, which is about 10 per 100,000 less than for 1905, also a low year comparatively speaking. The cause of the rise is due of course to a number of influences, but most potent among them is the rapid increase in the population of Youngstown and the Mahoning valley just above Youngstown. The increasing density of the population rendered more and more unsafe the wells about the city and also added materially to the dangerous pollution of the public water supply. The decline in typhoid during 1904 and 1905 is no doubt due in part to the care which a large intelligent portion of the population have exercised in securing a proper drinking water. Such would seem also to be borne out by the facts of the investigation, for but very few cases occurred among the upper classes. Furthermore, certain natural causes which have been operative throughout a large part of the country east of the Mississippi River should be credited with a portion of the reduction.

Diagram III shows the monthly variation in typhoid for the same period of thirteen years. Owing to the comparatively small population to which the figures apply, the diagram does not make specially apparent any definite law of variation. Many of the peaks may be due to small epidemics such as might come from a milk supply or a polluted well used by a large number of persons, but it will also be noted that the most

prominent peaks occur in the third or fourth month of the year and during the early autumn months. It becomes of interest to know to what extent these early spring and early fall rises in the typhoid death rate are due to the public water supply and to what extent to general causes. The contention that the public water supply even before filtration was not responsible for typhoid in Youngstown may receive some support in view of the now established fact that metallic iron and salts of iron, such as are discharged into the Mahoning River in large quantities by numerous steel plants, have a certain bactericidal action. On the other hand, it may be contended that the public water supply has always been responsible for the great bulk of typhoid fever and must, therefore, be responsible for at least a considerable part of that occurring during the present year. In the following discussion an attempt is made to throw some light on this subject by statistical evidence.

In 1902 Professors William T. Sedgwick and C.-E. A. Winslow, of Boston, made elaborate "Statistical Studies on the Seasonal Prevalence of Typhoid Fever in Various Countries and Its Relation to Seasonal Temperature," the same being published in the *Memoirs of the American Society of Arts and Sciences*. With these studies were presented diagrams showing the relation of typhoid fever deaths to seasonal temperature changes for a number of cities, some with pure and some with polluted water supplies. These diagrams were prepared by averaging the monthly deaths from typhoid for a period of ten years. The average number of deaths for each month was then expressed as a percentage of the yearly average for the same period. In this way relative monthly death rates were obtained which were independent of the actual number of deaths. These average monthly percentages of the yearly average were then plotted to a convenient scale in connection with average monthly temperature for the same ten year period. The typhoid curve is plotted two months ahead of the temperature curve, which allows for the average time required for incubation and sickness. In this way the curves are brought more closely together and the parallelism made more striking. For figures on which curves are based see Appendix IV. Referring to the cities of Baltimore (Diagram IV), New York (Diagram V), Denver (Diagram VI), and Boston (Diagram VII), all of which have water supplies practically free from injurious pollution, it will be seen that the typhoid and temperature curves correspond with remarkable regularity. The curves for the Empire of Japan (Diagram VIII) are also given as being another striking illustration. The number of persons included in the figures represented in this diagram and using polluted public water supplies is insignificant in comparison with the total number. Referring now to the cities of Cincinnati (Diagram IX), Philadelphia (Diagram X), Chicago (Diagram XI), Paris (Diagram XII), and Berlin (Diagram XIII), all of which had more or less polluted public water supplies during the period covered by the figures, these show no such regular parallelism



between the typhoid and temperature curves. In general, there will be one peak corresponding to maximum temperature (note Chicago, Philadelphia, Paris and Berlin). In the case of Cincinnati, the peak corresponding to high temperature is nearly obscured by the high typhoid occurring at other seasons of the year; also the typhoid occurring from January to March overshadows the typhoid for all other parts of the year. As pointed out by Sedgwick and Winslow, these prominences which occur in the late winter or early spring and again in the late fall and early winter are due to the polluted water supply. The rise in the typhoid death rate at these times is just subsequent to thaws or high stages in the stream from which the water supply is taken. The spring and autumn peaks of the city of Chicago, which has a lake supply, must be explained on the basis of increased flow of sewage due to thaws or rainfall being washed out into Lake Michigan and into the water-works intake crib.

Numerous other diagrams were presented by Sedgwick and Winslow, but only certain of the characteristic ones have been reproduced. Some of the diagrams were very irregular, but in all these cases it was clearly shown by the authors that the number of cases reported was "too small to eliminate the haphazard effect of epidemics."

A diagram for Youngstown (Diagram XIV) has been prepared in the same manner in which the above discussed curves were prepared. The figures used cover the thirteen years from 1893 to 1905. In order to learn if the typhoid curve was a fair average, it was plotted with several of the most abnormal years omitted. The effect on the general character of the curve was very slight, so all the figures have been included in the diagram presented. The general similarity of the Youngstown curve to the diagrams for cities having polluted water supplies will at once be noticed. In Youngstown the peak due to seasonal temperature is well marked, showing that considerable prosodemie typhoid fever has existed during the period considered. The peak in the spring is very prominent; there is also a rise in the autumn, but this does not terminate in a peak, being overshadowed by the spring rise. In this respect, the Youngstown curve corresponds to the curve for Berlin, though the peak in the former comes two months later than in the latter.

Hence, reasoning from analogy, it would appear that during the thirteen years considered a large number of typhoid fever deaths have been due to the public water supply, as evidenced by the very considerable rise in the typhoid curve in the winter and spring months. Likewise, the marked peak occurring in the latter part of the summer indicates conclusively that the city has always suffered from a considerable amount of typhoid fever due to general causes.

#### CONCLUSIONS.

From the foregoing the following conclusions have been reached:

1. That typhoid fever at the present time is not due to the public



water supply, although in the past much was attributable to this source. The occurrence of a few cases during the early part of the present year, which seemingly point to the public water supply as the source of infection, emphasizes the necessity of continuing the rigid supervision of the filter plant that has obtained since March of the present year.

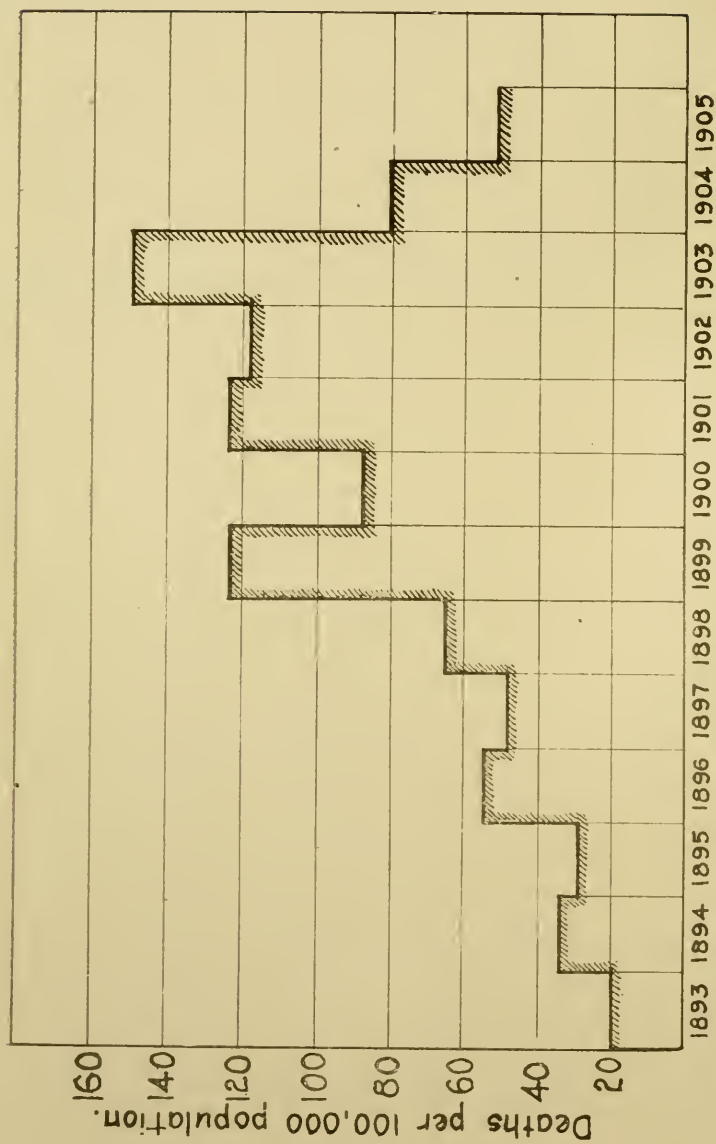
2. That a very large number of the locally infected cases of typhoid are due directly or indirectly to the presence of numerous old fashioned privy vaults and polluted wells.

3. That much typhoid fever is brought about by uncleanly living and the consequent infection of food.

4. That some cases of typhoid have been infected through the agency of flies carrying fecal matter from some nearby privy to kitchens in which food was being prepared.

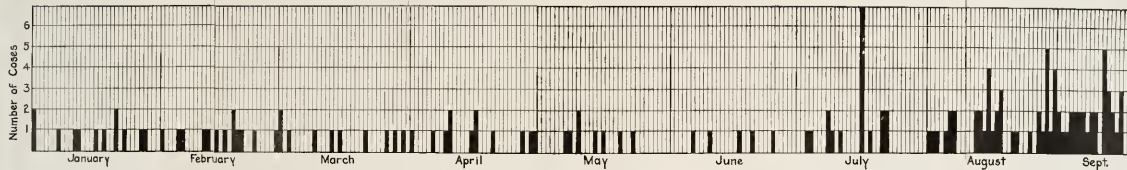
5. That the prevailing increased typhoid death rate throughout the whole country during the present year, whereas that for Youngstown has fallen off, would indicate that the filtration plant has saved many lives.

Diagram No. II



Annual Deaths from Typhoid per 100,000 Population.

Diagram No. I



Distribution of Typhoid by Days in 1906.

All cases infected in Youngstown.

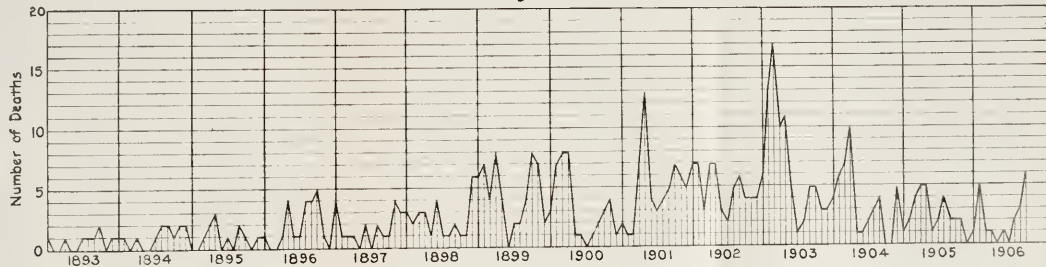
# Diagram No III



Number of Typhoid fever Deaths by Months

Ave.	July	Nov.	Mar.	Ave.
	Typhoid			
New York City				

Diagram No. III



Distribution of Typhoid Fever Deaths by Months. 1893 to 1906

P.H.



DIAGRAM IV.

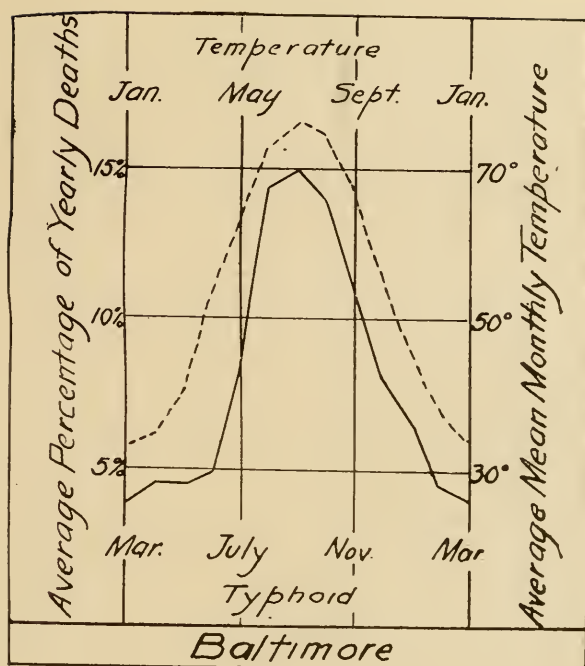


DIAGRAM V.



DIAGRAM VI.

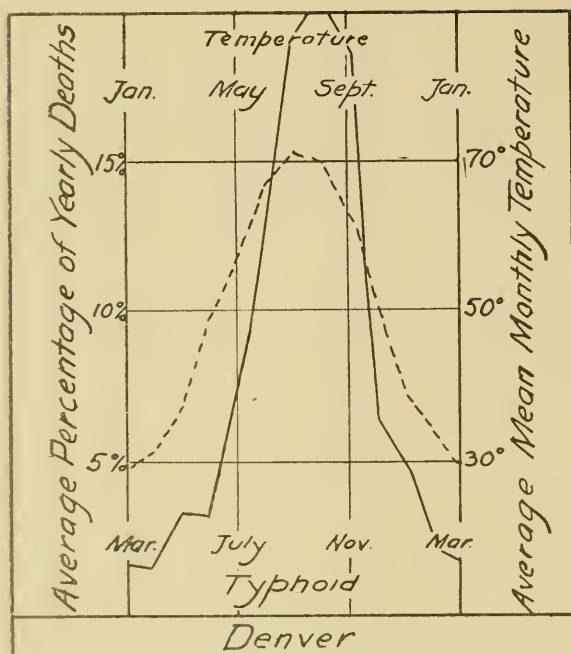


DIAGRAM VII.

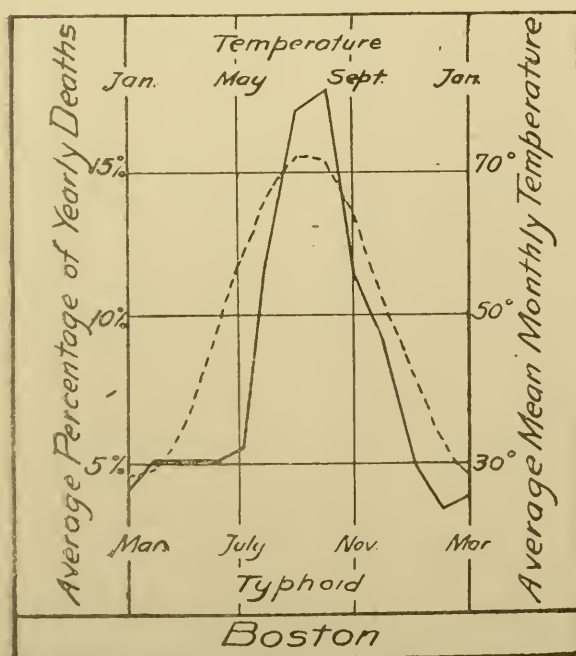


DIAGRAM VIII.

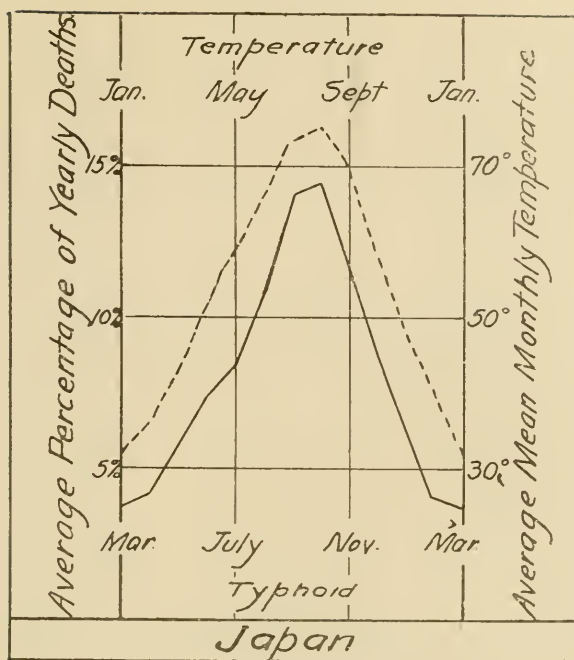


DIAGRAM IX.

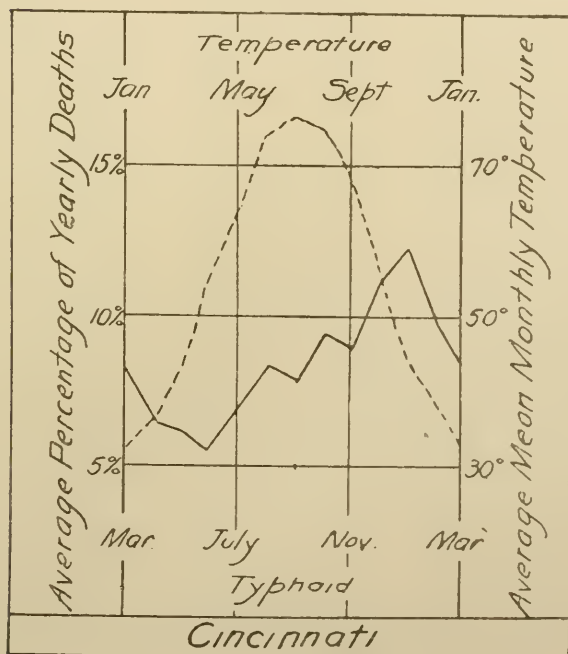


DIAGRAM X.

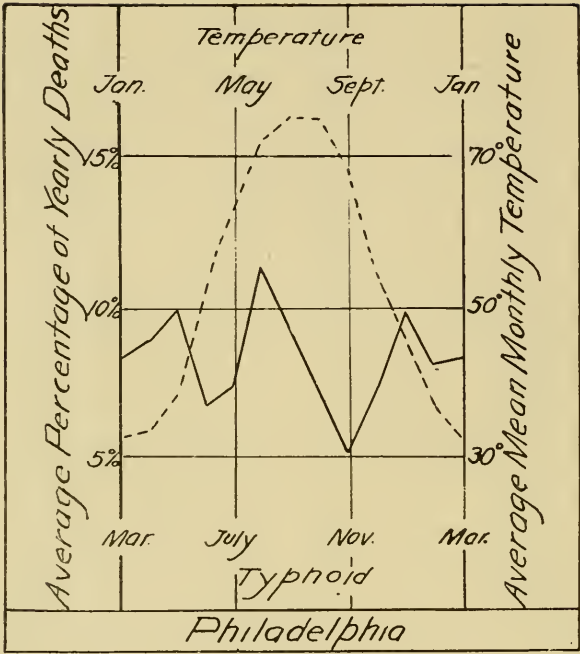


DIAGRAM XI.



DIAGRAM XII.

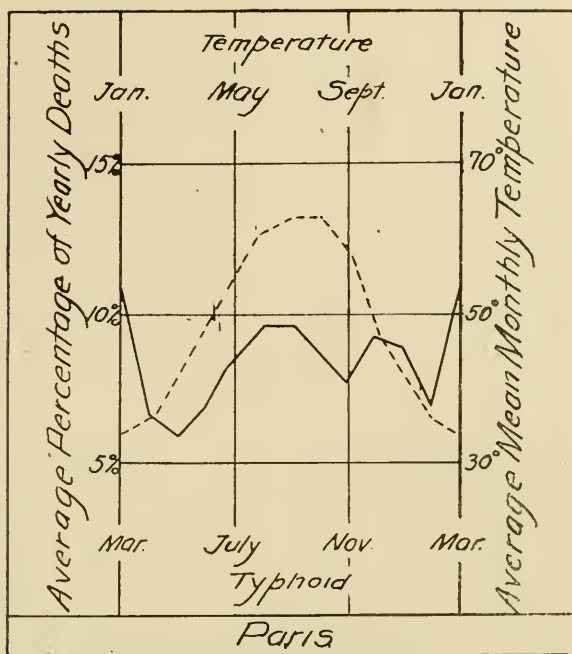


DIAGRAM XIII.

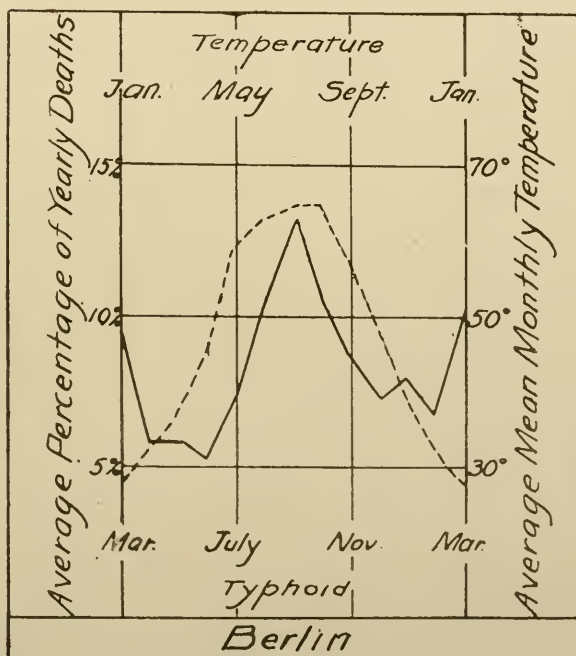
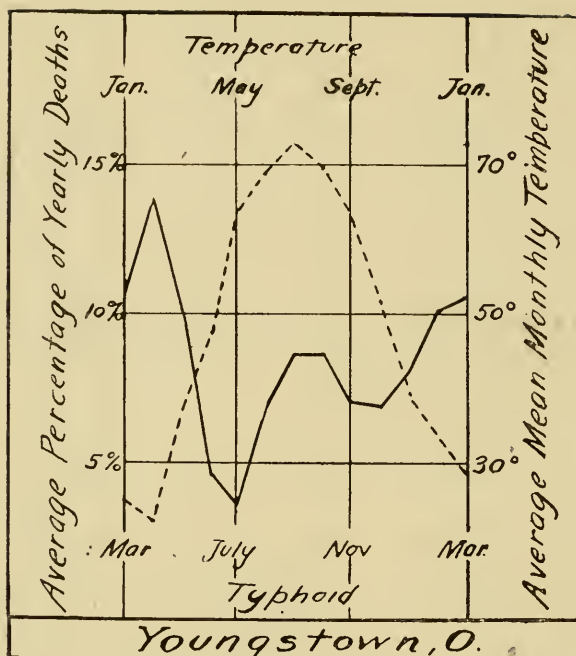




DIAGRAM XIV.



## APPENDIX I.

## LIST OF TYPHOID FEVER CASES INFECTED IN YOUNGSTOWN BETWEEN JANUARY 1st and SEPTEMBER 24th, 1906, ARRANGED IN CHRONOLOGICAL ORDER.

The following information was obtained by personal visits to the homes of patients and in many instances to their places of occupation. In a number of cases the patient himself was questioned, but in general the facts were obtained from one or more members of the patient's family. About half a dozen cases were visited at the city hospital, but this method of getting information was found very unsatisfactory, most of the patients being too ill to answer intelligently; as a rule it was found that near relatives knew more about the cases than the persons affected.

Some attempt has been made to indicate the probable source of infection in individual cases where this seemed warranted, but generally, only the bare facts are stated. The results obtained from this mass of data as a whole are given in the main body of the report.

*Case 1.* Mary Seefried, 319 West Myrtle Avenue. Attending physician; Dr. D. F. Hawn. Age 40. Occupation, housewife. Taken sick December 29th, 1905; died January 5th, 1906. The house in which the patient lived is located on high ground, and the premises are kept in fairly neat condition. The house is not provided with sewer connection

or the public water supply. For drinking purposes water from a well located back of the house was used exclusively. On the up hill side are two privies within 50 feet. Milk was obtained from J. F. Smith. There had been no other cases in the house, as far as could be learned.

*Case 2.* A. L. Poland, 207 East Wood Street. Attending physician, Dr. J. J. Thomas. The patient was confined at city hospital. Age 39. Occupation, attorney. Taken sick January 1st; recovered February 10th. The house is located on moderately high ground and kept in a neat and clean condition. Also provided with sewer connection and public water supply. It is claimed that for drinking purposes the Wheeler Mineral Spring water and a well located in the rear of the house were used exclusively. There are no privies in the immediate neighborhood of the well, but the entire district to the north is well populated, many of the houses being provided with privies. As this case has since left town, other definite information could not be obtained.

*Case 3.* Charles Boudon, 112 West Woodland Avenue. Attending physician, Dr. Shaffer. Confined at city hospital. Age 18. Occupation, salesman in local store. Taken sick January 7th; recovered March 4th. Before taking sick the patient had been in Youngstown for at least a month, and had used both well and city water. The house is located on high ground overlooking the river. The well is drilled and is said to be of considerable depth. Formation pierced could not be ascertained. There are no polluting influences in the near vicinity of the well. The house is connected with public water supply and city sewers.

*Case 4.* George Scott, 32 Garfield Street. Attending physician, Dr. S. Shiller. Confined at city hospital. Age 17. Occupation before being taken sick, puddler at the Republic Works of the Brown, Bonnell Steel Company. Drank well water only. The patient had been in Youngstown until a week before going to bed, when he visited Niles for several days. Sanitary conditions about the house were fair. The house is connected with the sewers and public water supply. It is claimed, however, that all drinking water was obtained from a shallow dug well in the rear of the house. This well is 14 feet deep and within 50 feet of two poorly constructed privies. There have been no other cases of typhoid fever in the house within memory of the occupants, however, there was a case next door during the previous summer, which may have influenced the well. Just after his return from Niles while skating he fell through the ice and this seemed to precipitate the fever.

*Case 5.* Charles Bartholomew, 310 Byron Street. Attending physician, Dr. V. V. Wicks. Confined at city hospital. Age 42. Occupation, puddler at the Republic Works of the Brown, Bonnell Steel Company. Taken sick January 18th; died February 21. Drank well water only. Had been in town for at least several months before taken sick. The house is located on rather high ground in a sparsely populated portion of the city. The surroundings of the house are kept in fairly sani-

tary condition. The house is not connected with either the sewers or the public water supply. The well is located in the rear of the house within 100 feet of several privies. As far as could be learned there were no cases of typhoid among friends or associates of the patient. His habits were fairly regular, so that the water at the mill and at home were probably the only water used to any great extent. It was stated that the patient seldom ate raw food, such as oysters, celery and lettuce, from which he might possibly have obtained the infection.

*Case 6.* Peter Kenealy, 1111 Oak Street. Attending physician, Dr. Whelan. Age 25. Occupation, pipe fitter at the Youngstown Sheet Steel and Tube Company's plant. Taken sick January 12th; recovered March 9th. Drank well water only. Had been in town for at least several months before taken sick. The house is located on moderately high ground and is kept in fairly neat and clean condition. It is not connected with either the sewers or the public water supply. Water at home was obtained from a well on the opposite side of the street and located in the back yard within 50 feet of a privy. The yard was considerably littered with rubbish of various sorts. At the works the patient claims to have drank well water which was "distributed about the works in pipes." A visit to the works revealed that no well water was thus distributed, but raw river water is conveyed through the pipe to various parts of the plant for cooling purposes. It is probable that this water was used by him. There were four or more other cases at the works at about the same time, which were likely infected in the same manner. The milk supply used by the patient was obtained from the Coitsville Dairy, but the patient is said to have drank but little. He also ate but small quantities of raw food, such as oysters, celery or lettuce. All discharges and bedding were properly disinfected during illness.

*Case 7.* Arthur G. James, 411 E. Woodland Avenue. Attending physician, Dr. Bennett. Confined at the city hospital. Age 30. Occupation, iron worker at the Youngstown Sheet Steel and Tube Company. Taken sick January 18th; died February 1st. Case complicated with hemorrhages of the bowels. Drank well water only. Had been in town for at least several months before taken sick. The house is provided with public water supply but is not connected with the sewers. The premises are kept in fairly sanitary condition. It is claimed that the city water was never used for drinking purposes by the patient, and that well water was used exclusively, both at home and at the works. The well at the house is located on a rather steep slope in the back yard and within 75 feet of a privy on the up hill side. While it is claimed that well water was used at the works, it is possible that the patient may have drunk some of the raw river water that is used about the plant for cooling purposes. There was one other case among the workers at the plant at the same time. At the house there had never been any typhoid fever so far as known. The patient was never known to drink milk or to eat raw

food, such as celery, lettuce and oysters, that might have carried the typhoid infection.

*Case 8.* Ernest Polantimo, 709 Oak Street. Attending physician, Dr. J. P. Kenny. Confined at city hospital. Age 16. Occupation, laborer in macaroni factory, on the corner of Boardman and Watt streets. Taken sick January 16th; recovered February 26th. Drank well water only. Had been in town for at least several months before taken sick. The sanitary condition of the premises was bad, though somewhat better than maintained by the average Italian family. The house is not connected with the public water supply or city sewers. The water used for drinking purposes was obtained from a shallow dug well close to and in the rear of the house. This well is loosely boarded over. Washing and various other operations are permitted about the pump, and wash water and other waste water may readily find its way into the well between the spaces in the boards. On the up-hill side of the well and within 75 feet there are several poorly constructed privies. There had been no other cases in the house previously and but few in the immediate neighborhood. It was not known whether there were any other cases among the employes of the macaroni factory; at least, none were heard of. The well used by employes at the macaroni factory is on low land and subject to pollution from various privies in the neighborhood.

*Case 9.* Frank B. Fowler, 517 Lydia Street. Attending physician, Dr. John Deetrick. Age 42. Occupation, yardmaster at the Youngstown Sheet Steel and Tube Works. Taken sick January 21st; died February 17th. Case complicated with heart failure. Drank well water only. Had been to Washington, D. C., for one week just before taken sick; otherwise had been in Youngstown for several months, so that infection was probably obtained in Youngstown. The premises were in a neat and clean condition. The house is provided with water from the public supply but has no sewer connections. For drinking purposes well water was used exclusively. The well is a dug well located in the rear of the house; within 40 feet and on the up-hill side is a poorly constructed privy. At the works well water was also used exclusively. The patient was known to be fond of raw oysters, but there is no special reason to believe that the infection was obtained from this source. There were no other cases in the immediate neighborhood, at the same time or shortly before. All discharges and bedding were properly disinfected during illness.

*Case 10.* Julius Seamon. 938½ Edgewood Street. Attending physician, Dr. L. B. Smith. Age 46. Occupation, millwright at the Brown, Bonnell Steel Company. Taken sick January 21st; recovered February 16th. Drank well water only. Had been in town for at least several months before being taken sick. The patient lived in a large tenement house which is occupied by a very poor class of foreigners and negroes and their families. The tenements are arranged in two large blocks located on a rather steep hillside and in a district where there are



but few other buildings. Accommodation is afforded in the two buildings for at least fifty families. One of the buildings is located directly on Edgewood Street, while the other is directly in the rear on the hillside and perhaps 50 feet distant. The surroundings of the tenements, as well as the interior of many of them, are exceedingly filthy. There are two large privies, one for each block, and located in the rear of the same. These privies are constructed with very large vaults, which are far from water-tight. Within scarcely 15 feet of each of the privies is located a shallow dug well, which furnishes the entire water supply for the tenement population. These wells cannot fail to be seriously polluted and it is a great wonder that more sickness has not occurred among the residents. As the patient or none of his family were to be found at the time of inspection, it was impossible to get any satisfactory information concerning his case, but the conditions found would be sufficient to explain the cause of his illness.

*Case 11.* Hazel M. Borgar. 916 High Street. Attending physician, Dr. F. A. Burneson. Age 5. Taken sick January 23rd; died February 2nd. Well water was used exclusively for drinking purposes. The patient had been in Youngstown for at least two months before being taken sick. Had been ailing since the middle of January, but was not sick enough to go to bed until the day mentioned above. It was stated that this case may not have been typhoid, although it was accompanied by a high fever. The sanitary condition of the premises was fair. The house is not provided with water from the public supply, but the privy which is in the yard has a sewer connection. The well, which is dug and 25 feet deep, is located within about 25 feet of the privy, but as the latter is connected with the sewer, this is not a very serious matter. The patient drank considerable milk which was obtained from Ripples' grocery store. There were no other cases in the same house or in the immediate neighborhood. All discharges and bedding were properly disinfected during illness.

*Case 12.* Mrs. R. A. McCracken. 349 West Myrtle Street. Attending physician, Dr. J. H. Bloom. Age 25. Occupation, housewife. Taken sick about January 27th; recovered during the first week in March. Drank boiled city water and well water. Patient had lived at the above address since December 15th. Previous to that time she lived on East Woodland Avenue. It is quite likely, however, that the infection took place at the new residence. At this place well water had been used exclusively for drinking purposes. The house is not connected with either the public water supply or the city sewers. The well seemed to be a shallow dug well, but no definite information could be obtained on this point. It is located within 60 feet of the privy, which is on the up-hill side. At the house on Woodland Avenue it was found that the well was a very deep drilled well in rock formation, but in such a location that it would receive the sub-surface drainage from a considerable built-up



area lying on the up-hill side. At this house city water was also used by the patient for drinking purposes. No one else in the family was ever sick with typhoid fever. One case (No. 1) on the same block occurred a short time before. All discharges and bedding were properly disinfected during illness:

*Case 13.* E. P. Slavin. 1132 Emma Street. Attending physician, Dr. F. S. Merwin. Age 19. Occupation, pipe fitter at the Youngstown Sheet Steel & Tube Company's Works. Taken sick about January 18th; was confined 13 weeks. The patient had been in Youngstown for at least several months before being taken sick. At home he generally drank city water; at the works it is said he drank well water exclusively. It could not be ascertained from which well at the works the water was obtained, and it is also possible that he occasionally drank the raw river water intended for cooling purposes. At about the same time the patient was taken sick there were several other cases (Nos. 6, 7 and 9) at the same works. The building in which the patient lived was also used as a grocery store. The place is kept in a clean and neat condition. The patient was never known to drink much milk and the small quantity which was drunk was obtained from the family's cow. All discharges and bedding were properly disinfected during illness.

*Case 14.* John Horan. 357 Monroe Street. Attending physician, Dr. T. J. Arundel. Age 24. Occupation, contractor for small work, such as laying sewers, digging cellars, working stone quarries, etc., etc. Taken sick February 1st; died February 13th. Drank well water only. The patient had been in town for at least several months before being taken sick. The house in which the patient lived is new and is kept in a fairly neat and clean condition. It is, however, located in a generally dirty and untidy neighborhood. The patient is said to have used well water exclusively for drinking purposes, most of which was obtained from a shallow well or spring located immediately back of the house. This spring has a reputation for its good quality, and analysis would indicate it to be a fairly safe water. This is probably due to the fact that it comes from underneath an impervious stratum of clay, which underlies this neighborhood. The surroundings of the spring, however, are very bad, and on the up hill side there are at least half a dozen privies very poorly constructed, none of which is at a greater distance than 60 feet. This well is also used by most of the employees in the Lower Valley Works, of the Brown, Bonnell Steel Company, the water being carried to the men in pails by water boys. Until the time of investigation the spring was poorly protected and located in such a way that surface washings might readily enter it; recently, however, it has been repaired and enclosed and a well made of 24-inch circular pipe with cemented joints. The water rises almost to the surface of the ground and is constantly flowing in a small stream. At the time the patient was taken ill there were no other cases in the neighborhood or any in the works among the men.

Infection was most likely obtained elsewhere, though not likely from the city water, as the patient is said to have had a strong prejudice against it.

*Case 15.* O. Grubb, 182 McKinnie Street. Attending physician, Dr. J. S. Zimmerman. Age 28. Occupation, carpenter. Taken sick about February 5th; recovered May 1st. Drank well water only. Had been in the city for at least several months before being taken sick, and during the month previous to his illness had been at work on the corner of Madison Avenue and Holmes Street. The house in which the patient lives is kept in a fairly neat and clean condition. It is connected with the sewers and public water supply. No city water, however, is used for drinking purposes, but water is carried from a neighboring well. This well is probably a dug well and is within 60 to 75 feet of several privies. The well at the corner of Madison Avenue and Holmes Street is also a dug well, and there are several privies in the neighborhood. Previous to this case there had been no other case in the same house or immediate neighborhood, though later in the summer there occurred a case (No. 118) on the same street and half a block distant. Near the corner of Madison Avenue and Holmes Street there occurred another case (No. 116) about the same time as Case 118. Inasmuch as the house is connected with the sewers it does not seem likely that Case 118 was in any way connected with this one nor does the history of that case warrant the assumption. The patient seldom drank milk or ate raw foods from which the infection might possibly have been obtained. All discharges and bedding were properly disinfected during illness.

*Case 16.* Helen Seifert. 1029 West Woodland Avenue. Attending physician, Dr. J. S. Zimmerman. Age 20 months. Taken sick about February 6; sick four weeks. Drank city water only. Had been in town since about December 24th. Until a week before taken ill had lived at 844 West Woodland Avenue, so that infection was probably taken while there. It is claimed that previous to illness the child had not had anything to drink but city water. But as there is a well on the premises this is open to some doubt. The house in which the family lived previous to the child's illness was in a fairly neat and clean condition. The house is connected with the public water supply and the city sewers. Milk for the child was obtained from Gamble & Sons, but there were no other cases among the consumers of this dairy at about the same time. Water from the well which may possibly have been used by the child was located in the rear of the house, but no privies are in the immediate neighborhood. All discharges and bedding were properly disinfected during illness.

*Case 17.* John McHale. 260 Oak Street. Attending physician, Dr. J. J. Thomas. Confined at city hospital. Age 23. Occupation, roller and rougher at the Republic Works of the Brown, Bonnell Steel Company. Taken sick February 11th; died March 2nd. Drank well water and probably city water. Had been in town for at least several months before being taken sick. Had been about town to a considerable extent and was

very careless about where and what water he drank. At home he drank water obtained from a shallow dug well on the premises, located about 60 feet from a privy. It was stated that at the works he sometimes drank the raw river water used for cooling purposes, though ordinarily he used well water provided for the men. Sanitary conditions about the house are fair, but it is not connected with either the public water supply or the city sewers. Sink drainage finds its way over the ground and into a neighboring gutter. There had been no other cases in the same house previous to his illness. A short time after his death a friend of his living a half block distant was taken sick with typhoid (Case No. 35). This case may, however, have been infected from a case of typhoid in the next door house. All discharges and bedding were properly disinfected during illness.

*Case 18.* Helen Trigg. 892 Mahoning Avenue. Attending physician, Dr. V. D. Viets. Age 12. Attended West Avenue school. Taken sick February 12th; recovered April 8th. Drank both city and well water. The patient had been in town for at least several months before being taken sick. The house in which the patient lives is on high ground sloping towards the river. The house as well as the surroundings are neat and clean. City water was used to a large extent, but well water, obtained from a drilled well 70 feet deep and located in the rear of the house, was used occasionally. This well is within about 75 feet of several privies, and the water is said to become turbid after hard rains, indicating that there is a rather direct connection between the surface and water-bearing stratum. At school the child used well water exclusively. The well at school is a deep drilled well, and the water is probably of good quality. There were no other cases in the immediate neighborhood, or among the schoolmates of the girl. The patient drank milk to a considerable extent before being taken sick, and this was obtained from G. R. Ryder. Some raw vegetables were eaten, but there is no reason to suspect these of having caused the infection. All discharges and bedding were properly disinfected during illness.

*Case 19.* Mabel Halben. 639 Duquesne Street. Attending physician, Dr. B. F. Collins. Age 12. Attended Market Street school. Taken sick February 14th; recovered in the early part of April. Drank both city water and well water. Had been in town for at least several months before being taken sick. Up to a week or so before taken sick the family lived at 230 Kyle Street, and it is said that the child complained of aching limbs and back before the family moved. It is claimed that at home city water was used exclusively for drinking purposes, though the child drank well water while at school. The house on Kyle Street was on rather high ground sloping towards the river. It is connected with the public water supply and city sewers, and flush closets were used instead of back-yard privies. There were no other cases in the house at the same time or previously, but shortly after there occurred another case (No.

24) on Kyle Street and about half a block removed. The patient drank more or less milk, which was obtained from Franklin's grocery store, other food supplies being obtained from the same place, but there is no reason for suspecting any of these of having caused the infection. All discharges and bedding were properly disinfected during illness.

*Case 20.* May McClurg. 219 Hughes Street. Attending physician, Dr. J. S. Zimmerman. Confined at city hospital during first eleven days of illness. Age 25. Occupation, music teacher. Taken sick February 16th; recovered during latter part of March. Drank well water only. Had been in town for at least several months before being taken sick. The house in which the patient lives is on moderately high ground and very neat and well kept. It is connected with the public water supply and city sewers. The patient had been ailing for a number of weeks before going to bed. During a month before typhoid fever developed well water from a neighboring well had been used for drinking purposes. Previous to this time city water had been used for drinking purposes. The patient drank no milk except in her tea and coffee, but she ate considerable raw food, particularly lettuce and celery. The well used for drinking purposes is dug, and is carefully protected from accidental pollution at the surface by concrete paving. The depth of the well could not be ascertained. There are no privies in the immediate neighborhood, and, if polluted, the polluting substances would have to travel a distance of several hundred feet. This would be entirely possible, however, on account of the loose rock formation from which ground water is obtained in this neighborhood. There were several other cases (Nos. 99, 120 and 146) in this neighborhood, but no relation could be traced between them. All discharges and bedding were properly disinfected during illness.

*Case 21.* Mike Menanich. 1024½ West Rayen Avenue. Attending physician, Dr. Frank S. Meyers. Age 24. Occupation, laborer at Ohio Steel Plant of the Carnegie Steel Company. Taken sick February 18th; died February 25th. Drank well water only. As far as could be learned the patient had been in town for at least several months before being taken sick. The house in which the patient lived is back from the street in the rear of another house. The surrounding neighborhood is occupied mostly by foreigners and the general sanitary conditions are bad. The house itself is very filthy and the yard about it is kept in an exceedingly bad condition. The yard has a drain to the sewer, but the house has no sewer connection, and is not connected with the public water supply. The well from which drinking water is obtained is located near the drain to the sewer and about 60 feet from a very poorly constructed privy. It is said to be a drilled well, but the depth is not known. There were no other cases among the users of this well or among the workmen at the steel plant, as far as could be learned. There occurred later in the season another case (No. 147) about a block from this one. It is doubtful



whether the discharges and bedding were properly disinfected during the patient's illness. The case was complicated with bronchitis.

*Case 22.* Henry Randall. 428 West Lincoln Avenue. Attending physician, Dr. J. K. Hamilton. Age 30. Occupation, helper at the Youngstown Foundry near the Upper Carnegie Steel Mill. Taken sick February 18th; recovered March 14th. Drank well water only. The patient had been in town for at least several months before being taken sick. The house in which he lived was in poor sanitary condition and is not connected with the public water supply or city sewers. The yard about the house was considerably littered with rubbish of various sorts. All the water used at home for drinking purposes was obtained from a dug well, depth unknown, which is located within 40 feet of a privy. Well water was also used at the works. Five other families also used this well, but during the present year there had been no other cases of typhoid fever among them. There had, however, been other cases in the same house in previous years. No other cases among workmen at the factory were known of. All discharges and bedding were properly disinfected during illness.

*Case 23.* Russell Pollack. 17 McKinnie Street. Attending physician, Dr. G. L. Pearson. Age 7. Attended Dellason school. Taken sick February 19th; recovered March 5th. Used well water exclusively. Had been in town for at least several months before being taken sick. The house in which he lives is very neat and clean. It is not connected with either the public water supply or the city sewers. The well from which drinking water is obtained is a shallow dug well and located within about 10 feet of a privy. This is the only case during the present year that has occurred among the users of this well. It is said, however, that there were several other cases in previous years. The boy also drank well water at school. No complete information as to his habits could be obtained, as the family had left town. All discharges and bedding were properly disinfected during illness.

*Case 24.* Mrs. Dora Sanders. 435 Kyle Street. Attending physician, Dr. L. B. Smith. Age 31. Occupation, housewife. Taken sick February 20th; died March 6th. Drank both city and well water. Had been in town for at least several months before being taken sick. The house in which the patient lived was in a fairly neat and clean condition. The well used for drinking purposes is located on a rather steep slope and within about 75 feet of a privy. The patient drank considerable milk, obtained from Heindel's dairy. As far as could be learned there occurred no other cases among customers of this dairy before or at the same time. There was no other cases in the same house, though there occurred another case (No. 7) on East Woodland Avenue, about half a block removed, a short time before. No connection between these two cases could be traced, however. All discharges and bedding were properly disinfected during illness. The case was complicated with meningitis.



*Case 25.* Irene Douglas. 1522 Elm Street. Attending physician, Dr. E. M. Ilgenfritz. Age 18. Attended Rayen Avenue school. Taken sick about February 23rd; sick about three weeks. Used both well and city water. Had been in town for at least several months before being taken sick. The house in which the patient lives is in a very neat and clean condition. It is connected with both public water supply and city sewers. At home city water is said to have been drunk exclusively. At school the patient drank well water. This water was drunk by her only occasionally. As far as could be learned the city water and the well water at the school was the only water used by the patient. She never drank milk, and ate but little lettuce and celery; ate no raw oysters. There was no one else sick in the same house or in the same neighborhood. There were no cases at the time or previously among her school friends. Somewhat later a case (No. 38) occurred in this school, but it is hardly likely that there is any relation between the two. The well water used at the school seemed to be of good quality, though showing evidences of past pollution. Whether or not it may become dangerous could not be ascertained from the analysis. All discharges and bedding were properly disinfected during illness. The case was a mild one, but is said to have given all the symptoms of typhoid fever.

*Case 26.* Laura Dolde. 130 Bresett Street. Attending physician, Dr. J. H. Bloom. Age 12. Attended Dellason Avenue school. Taken sick February 28th; recovered March 17th. Said to have used well water exclusively for drinking purposes. Had been in town for at least several months before being taken sick. The house in which the patient lived is in a very neat and clean condition, and is connected with both the public water supply and the city sewers. Water for drinking purposes at the house was obtained from a dug well on the opposite side of the street. This well was within 80 feet of several privies. Well water was drunk at school. Milk was obtained from a country milkman whose name could not be learned. There was one other case (No. 23) of typhoid fever in the Dellason Avenue school at about the same time; but the evidence does not place the school water under suspicion. A short time later there occurred another case (No. 30) on the same street and within a few doors. It is probable that water was obtained from the same well. All discharges and bedding were properly disinfected during illness.

*Case 27.* James Griffen. 560 Mahoning Avenue. Attending physician, Dr. D. W. Baker. Confined at city hospital. Age 6. Attended St. Columba's school. Taken sick March 1st; recovered March 21st. Used both city and well water. Had been in town for at least several months before being taken sick. The house in which the patient lives is very neat and clean, and is connected with both the public water supply and city sewers. At the house the public water supply was used exclusively for drinking purposes, while at school the boy drank well water only. The father (Case No. 47) of the patient was taken sick April

29th. There had been no cases previously in the same house or immediate neighborhood. Somewhat later there occurred a case (No. 44) of typhoid fever within about half a block, but the two cases apparently bear no relation to each other. The boy drank milk which was obtained from Powell & Hecklard. All discharges and bedding were properly disinfected during illness.

*Case 28.* Anna Shea. 316 Oak Street. Attending physician, Dr. C. M. Klyne. Age 14. Attended St. Columba's school. Taken sick March 1st; died March 21st. Had been in town for at least several months before being taken sick. Drank well water exclusively. The building in which the patient lived was a residence and grocery store combined and was kept in fairly clean condition. It is not connected with the public water supply or the city sewers. The well is a dug well 20 feet deep, poorly protected at the top with boards, and is within about 50 feet of a privy. There had occurred no other cases in the house. There was one other case (No. 27) occurring at the same time in St. Columba's school, but the patient was in a lower class and unknown to Anna Shea. The patient ate no lettuce or celery or raw oysters, nor drank any milk. The case was complicated with pneumonia and kidney trouble. For a long time it was stated to have been pneumonia only. As the patient had been sick before typhoid fever developed she had been at home most of the time, and had had no contact with other persons suffering with typhoid. During part of the illness the discharges and bedding were not disinfected, as the case was not believed to have been typhoid.

*Case 29.* James Stanton. 811 Mahoning Avenue. Attending physician, Dr. J. A. Cross. Age 11. Attended West Street school. Taken sick March 3rd; recovered March 13th. Drank well water exclusively. Had been in town for at least several months before being taken sick. The house in which the patient lives is kept in a very neat and clean condition. The house is connected with the public water supply and the city sewers. Water is obtained from a drilled well in the rear of the house said to be 90 feet deep in the rock, and is within about 100 feet of several privies. The well at the West Street school is also a deep drilled well in the rock. There had been no other cases in the same house two years previously. This year there had been no other case in the immediate neighborhood. There were no other cases among the boy's school companions at the same time. The boy drank more or less milk, which was obtained from James Rider, and ate practically no celery, lettuce or raw oysters. All discharges and bedding were properly disinfected during illness.

*Case 30.* Leona Roe. 114 Bresett Street. Attending physician, Dr. J. H. Bloom. Age 20. Occupation, dressmaker. Taken sick March 9th; sick 14 days. Very mild case. Drank both city and well water. Had been away from town for one week just previous to having taken sick, otherwise had been in town for at least several months. The house in

which the patient lives was in a very neat and clean condition, and is connected with the public water supply and city sewers. It is believed that water was occasionally obtained for drinking purposes from the same well that was used by Case No. 26. Patient drank more or less milk, which was obtained from Baldwin. No other cases were found among other consumers of this milkman. The nearest case in the neighborhood was the one above referred to, which was only a few doors removed. The patient had not been in contact with anyone else having typhoid fever. During illness all discharges and bedding were disinfected.

*Case 31.* Mrs. L. S. Godard. 254 West Wood Street. Attending physician, Dr. Wm. H. Taylor. Confined at city hospital. Age 21. Occupation, housewife. Taken sick about March 13th; recovered April 6th. The patient lived at boarding house where well water was used for drinking purposes exclusively. The boarding house is kept in fairly neat and clean condition, and there occurred no other cases among the boarders during the present year as far as could be learned. There was one case (No. 32), however, in the immediate neighborhood which may have used the same well. This person was taken sick very nearly the same time as Mrs. Godard. All discharges and bedding were properly disinfected during illness.

*Case 32.* Michael Hannon. West Wood Street. Attending physician, Dr. Blaine. Confined at city hospital. Age 27. Occupation, shipping clerk. Taken sick about March 15th; recovered April 14th. Said to have used well water only. No additional information could be obtained, as Hannon could not be found. This case was probably located within a block of Case No. 31.

*Case 33.* Margaret Farragher, 412 North Avenue. Attending physician, Dr. R. M. Morrison. Age 25. Occupation, clerk at J. N. Enwer's department store on West Federal Street. Taken sick about March 21st, sick five weeks. Drank both well and city water. Had been in town for at least several months before being taken sick. The house in which the patient lived was very neat and clean, and was connected with the public water supply and city sewers, but an old privy in the rear of the house is still in use. There is a dug well in the rear of the house about 75 feet distant from this privy, but it is said that this was not used by the patient for several weeks before she was taken ill. It is claimed that city water only was used at the house, but while at the store water from a well in the rear of the store was used by the clerks. There occurred one other case (No. 108) among users of this well. The patient also ate considerable lettuce that was purchased at different places. Drank no milk, ate no other raw foods or raw oysters. There were no other cases in the house though there were seven cases (Nos. 22, 48, 80, 82, 90, 105) within a radius of 500 feet from the house; one of which (No. 22)

occurred only a month earlier, the others all occurred somewhat later. During illness all discharges and bedding were properly disinfected.

*Case 34.* Mrs. Anna Daley, 919 Foster Street. Attending physician, Dr. Shaffer. Confined at city hospital. Age 44. Occupation, housewife. Taken sick March 26, recovered first part of May. Drank well water principally and the public water supply occasionally. Had been in town for at least several months before being taken sick. The house in which the patient lived was in a neat and clean condition. It is connected with public water supply and city sewers. It appeared that the plumbing in the cellar was in bad condition and sewer gas had been escaping into it for several weeks previous to the patient's illness. The well from which water was obtained for drinking purposes is located near by on the corner of Burke and Foster streets. This well is probably a dug well of considerable depth, it is fairly well protected at the top from accidental pollution. About the first of March the pump was repaired during which operation the well may have been polluted. There are no privies in the immediate neighborhood, but there is a sewer near by on Burke Street and on the up-hill side. The patient never drank milk or ate raw vegetables or raw oysters. There were no other cases in the same house, though there occurred another case (No. 51) about half a mile distant to the south. All discharges and bedding were properly disinfected during illness.

*Case 35.* Peter Welsh, 301 North Watt Street. Attending physician, Dr. M. V. Cunningham. Age 19. Occupation, iron worker at the Youngstown Sheet Steel and Tube Company. Taken sick March 28th; died April 25th. Drank well water only. Had been in town for at least several months before being taken sick. The house and premises were in a fairly neat and clean condition. The house is connected with the public water supply but not with the sewers. Sink drainage is allowed to flow over the surface of the ground and into a neighboring gutter. The well from which all drinking water is obtained is located on the same lot with the house and within about 50 feet of a privy. At the works he drank well water, which may or may not have been of good quality, and it is also possible that he occasionally drank the water used for cooling purposes. The patient never drank milk or ate vegetables or raw oysters. About three weeks before taking sick the patient had attended a wake of a friend who lived a half block distant and also died with typhoid fever (Case No. 28). Next door to the patient there had been a case (No. 28) of typhoid fever which resulted fatally, the death occurred just one week before Welsh was taken sick. This patient had typhoid fever complicated with pneumonia. It was for a long time believed to have been pneumonia only, therefore the discharges and bed clothing had not been properly disinfected, during a considerable part of the illness. It is quite possible that the well from which the drinking water was obtained was polluted by leachings from the privy of the next door. There were also



two other cases (Nos. 56 and 151) in the same neighborhood occurring somewhat later. All discharges and bedding were properly disinfected during illness.

*Case 36.* Joseph A. Finch, 31 North Hine Street. Attending physician, Dr. A. S. Green. Age 18. Employed at Youngstown Sheet Steel and Tube Works. Taken sick March 30th; recovered May 4th. Drank well water only. Had been in town for at least several months before being taken sick. The house is located on a rather steep slope and is in a fairly clean condition. It is not connected with either the public water supply or the city sewers. The well used for drinking purposes is a shallow dug well in the rear of the house and is about one hundred feet from the privy, on the down-hill side. The patient drank practically no milk, ate little celery or lettuce and no raw oysters. There were no other cases in the house or among friends or fellow workmen. There was one other case (No. 68) on the same street and half a block removed. The case was complicated with pneumonia. All discharges and bedding were properly disinfected during illness.

*Case 37.* Mrs. A. A. Hyland, 358 Grant Street. Attending physician, Dr. E. W. Coe. Age 32. Occupation, housewife. Taken sick about April 1st; recovered May 1st. The patient generally used the public water supply for drinking purposes, though well water was sometimes used. The house is located on rather high ground and is kept in a neat and clean condition. The house is connected with both the public water supply and city sewers. The well is located in the rear of the house and is within 40 feet of the privy. The patient drank more or less milk, which was obtained from Silas Shook, raw vegetables were also eaten in small quantities. There were no other cases in the immediate neighborhood or among users of the well, though there were two other cases (Nos. 82 and 105) about a block removed, somewhat later in the season. All discharges and bedding were properly disinfected during illness.

*Case 38.* Charles Bowser, 419 Glenwood Avenue. Attending physician, Dr. V. D. Viets. Age 15. Attended Rayen Avenue school. Taken sick April 6th; recovered June 22d. Drank well water only. Had been in town for at least several months before being taken sick. The patient's home is located on high ground and is kept in a very neat and clean condition. It is not as yet connected with the public water supply or city sewers. The well is probably drilled to considerable depth in loose sandstone formation. About 50 feet away from the well is a privy. This neighborhood is but slightly built up, all of the houses are new, and it seems hardly probable that the well should have been polluted. At school the boy drank from the school well, which has been referred to under Case 25. The patient drank considerable milk before being taken sick, which was obtained from a private cow. He ate small quantities of celery and lettuce but no raw oysters. There were no other cases in the same house or immediate neighborhood. There were no cases among his



schoolmates at the same time. A little over a month previously there occurred another case (No. 25) in the Rayen school. The case was severe and complicated with pneumonia. All discharges and bedding were properly disinfected during illness.

*Case 39.* Arthur Kendall, 913 West Federal Street. Attending physician, Dr. C. N. Klyne. Age 8. Attended Covington Street school. Taken sick April 9th, sick three weeks. Drank well water only. Had been in town for at least several months before being taken sick. The house in which the patient lives is in a rather poor condition. The well from which drinking water is obtained is located immediately back of the house. It is a shallow dug well 20 feet deep and within 40 feet of the privy. The yard in the neighborhood of the well is in a rather untidy condition. The patient drank no milk and was said to have drunk very little water. There had been no other cases in the same house previously. Just about five months later the 14-year old brother was also taken sick with typhoid fever (Case 139). There were two cases (Nos. 49 and 52) on Morrison Street and about a block removed, which occurred a short time afterwards. It is said that on Morrison Street there has always been more or less typhoid fever. As the sub-surface drainage is probably from Morrison towards the Kendall well, it is possible that the cases in this family may be due to bad well water. All discharges and bedding were properly disinfected during illness.

*Case 40.* John Hogan, 227 River Street. Attending physician, Dr. J. H. Bennett. Confined at city hospital. Age 15. Employed at Gearing Bro.'s Coffee Company. Taken sick April 10th, recovered June 1st. Used both well water and public water supply. Had been in town for at least several months before being taken sick. The house and premises in which the patient lived were rather uncleanly and untidy. The house is not connected with either the public water supply or city sewers, the same not being available on this street. The neighborhood consists of low ground made up of river drift deposits. It is so low that at times of high water the whole district is flooded. The underlying material is principally gravel and sand. Wells sunk into this at a depth of 18 to 20 feet give an abundant supply of water. The whole district is practically honeycombed with privies. There are also two very large sewers which pass through this district and empty into the Mahoning River near by. The well, from which water used by the patient was obtained, is immediately back of the house and is about 20 feet deep and loosely covered with boards. It is claimed that at times of heavy rains water in the well becomes turbid. Within 30 feet of the well are several privies. Analysis of the water indicates it to be of very poor quality and liable to serious pollution. While at work the patient drank of the public water supply only. He drank no milk nor ate any raw vegetables or raw oysters. On the same day that the patient took sick his thirteen year old sister (Case

41) was also taken sick, indicating the same source of infection. No other cases occurred in this neighborhood at the same time or previously during the year. During the several months following there occurred five other cases (Nos. 89, 106, 110, 115 and 122) within a radius of about 800 feet.

*Case 41.* Mary Hogan, 227 River Street. Attending physician, Dr. J. H. Bennett. Confined at city hospital. Age 13. Attended South Side school. Taken sick April 10th; recovered June 13th. Drank well water only. Had been in town for at least several months before being taken sick. The information given under Case 40 applies to the condition of premises and other features relating to the probable cause of the disease.

*Case 42.* Bertha Gwatkins, 947 Shelby Avenue. Attending physician, Dr. C. H. Klyne. Age 21. Occupation, employed at Electric Banner Works. Taken sick April 15th; sick four weeks. Drank both well and city water. Had been in town for at least several months before being taken sick. The house in which the patient lived is on fairly high ground with steep slope. The house as well as the premises are in a neat and clean condition. The well which is probably a deep dug well, is located immediately back of the house and is well protected at the top. There is a privy 30 feet distant on the up-hill side, and another 40 feet distant at about the same level. A city sewer is on the up-hill side and about 50 feet distant. The house is not connected with the public water supply or city sewers. At the works the patient drank city water only. The patient drank more or less milk, which was obtained from Gilkison's dairy, also ate celery and lettuce obtained from a neighboring grocery. There were no other cases in this neighborhood, but cases had occurred in the same house during previous years. All discharges and bedding were properly disinfected during illness.

*Case 43.* Charles H. Morgan, 1112 Hillman Street. Attending physician, Dr. J. S. Zimmerman. Confined at city hospital. Age 21. Occupation, puddler at the Republic Works of the Brown-Bonnell Steel Company. Taken sick April 16th; recovered May 16th. Had been in town for at least several months before being taken sick. The house and premises were in a neat and clean condition. The house is not connected with either the public water supply or city sewers. Drinking water is obtained from a dug well 26 feet deep in the rear of the house and about 80 feet distant from the privy. The privy is on the up-hill side, but not in a direct line. The top of the well is poorly protected. At the works it is claimed that well water was used entirely, though it is possible that he may have drunk some of the water furnished for cooling purposes. There were no other cases in the house or immediate neighborhood.

*Case 44.* Mr. Brooks, 581 Mahoning Avenue. Attending physician, Dr. W. J. Ritchie. Age 26. Occupation, traveling salesman for the Cleveland Provision Company. Taken sick April 16th; recovered May 24th. Drank no city water. In the course of his business he traveled to Niles and Warren three days in each week, but always reached Youngs-

town in the evening, otherwise had been in town for at least several months before being taken sick. The house in which he lived before taking sick was a combination, grocery store and dwelling. This is connected with the public water supply and city sewers. The premises are kept in a neat and clean condition. There is also a dug well in the rear of the house 40 feet from the privy and on the down-hill side. Water from this well and Gibson spring water were used exclusively for drinking purposes, except when the patient was at Warren or Niles, where the supply from which he drank is unknown. He drank considerable milk at various restaurants and ate no celery or lettuce or raw oysters. There were no other cases at this house during the present year, though there occurred one case during the year previous. There had been two other cases (Nos. 27 and 47) on the opposite side of the street about half a block distant. These occurred a short time before.

*Case 45.* Miss Alice McBurney, 16 West Woodland Avenue. Attending physician, Dr. J. S. Zimmerman. Confined at city hospital. Age 23. Occupation, kindergarten teacher at Christ's Mission on East Federal Street. Taken sick about April 20th; recovered June 7th. Drank both city and well water. Had been in town for at least several months before being taken sick. The house in which the patient roomed is exceedingly neat and clean, and is connected with the public water supply and city sewers. The well, located near by, was generally used for drinking purposes. It is a deep drilled well in rock formation. The patient boarded at a house on Oak Hill Avenue a short distance away. The premises here were also neat and clean and well water was generally used. At the mission school on East Federal Street the sanitary conditions were poor, and it is possible that city water was obtained here for drinking purposes. As the patient herself could not be seen it was impossible to determine whether she was in the habit of eating raw foods or drinking much milk. There also occurred another case (No. 54) in the same house just about a month later. This case was also a kindergarten teacher at Christ's Mission school, and had essentially the same habits as Miss McBurney. There had been no other cases in the same house, though there occurred one other case (No. 3) in the neighborhood in the early part of the year.

*Case 46.* Fred L. Fisher, 667 Hayes Avenue. Attending physician, Dr. W. E. Bane. Age 29. Occupation, insurance solicitor. Taken sick April 27th; recovered June 1st. Drank both city and well water as far as could be learned. Had been in town for at least several months before being taken sick, but had made frequent short visits to Struthers. The premises in which he lived were very neat and clean. The house is not connected with public water supply or city sewers. The well from which drinking water was obtained is located in the rear of the house and is between two privies, in direct line with them and about 50 feet from each. As the patient had moved from town it was impossible to learn about his

habits. There had been no other cases in the house within several years at least.

*Case 47.* James M. Griffin, 560 Mahoning Avenue. Attending physician, Dr. P. W. Baker. Age 47. Occupation, supervisor on B. & O. Railroad. Taken sick February 29th; recovered June 1st. Drank water from various sources. Was in town a portion of the time, and traveled on trains between Youngstown and Akron. The house in which patient lived was in a neat and clean condition, and is connected with public water supply and city sewers. It stands on low ground near the B. & O. Railroad station. The patient drank more or less milk and ate some raw vegetables. Was not known to have eaten very many raw oysters. The six year old son of the patient was taken sick with typhoid fever (Case No. 27) about two months previous and recovered the latter part of March. There occurred one case of typhoid fever (Case No. 44) on the opposite side of the street about half a block removed. All discharges and bedding were properly disinfected during illness.

*Case 48.* John Harvey, 420 North Avenue. Attending physician, Dr. D. W. Baker. Age 30. Occupation, motorman on Mahoning Valley Interurban Railway. Taken sick April 30th; recovered June 24th. Drank well water only. The freight car which the patient had in charge ran between Levittsburg and Newcastle, always reaching Youngstown in the evening. The house in which the patient lived was in a neat and clean condition, and is connected with the public water supply and city sewers. There is a well in the rear of the house from which drinking water is obtained. This well is about 40 feet from a privy, and somewhat on the up-hill side. The patient drank no milk, but ate considerable lettuce and celery. Not known to have eaten any raw oysters. There have been no other cases in the same house as far as is known. A short distance from the house there occurred another case (No. 33) a little over a month previously. The well used by this case was also within a short distance from the same privy, but it is claimed that this well was not used for drinking purposes. There were a number of cases in this neighborhood, eight (Nos. 22, 33, 60, 80, 82, 90, 105 and 114) having occurred at various times during the year and within a distance of 500 feet.

*Case 49.* Anthony Yaskulki, 640 Morrison Avenue. Attending physician, Dr. W. C. Stafford. Age not known. Occupation, probably in lower Carnegie-Steel Mills. Taken sick about May 7th; sick about four weeks. Probably drank well water only. No one in this neighborhood could be found that could speak English or knew the patient. The general neighborhood is in an exceedingly unsanitary condition, and the well at the house where the patient lived is very poorly protected at the top, and is within 30 feet of a privy. The privies are in a very bad condition and overflow the surface of the surrounding ground. There was another case (No. 52) occurring a short time later.

*Case 50.* Frank Lucca, 2142 West Federal Street. Confined at city



hospital. Age 22. Occupation, laborer at Erie Railroad round house. Taken sick about May 8th; recovered May 30th. Drank well water only. Had been in town for at least several months before being taken sick. The house in which he lived is fairly clean for the Italian laboring class, and is connected with the public water supply. The premises about the house were in a bad condition and strewn with garbage in various stages of decomposition. Sink drainage was allowed to flow over the surface of the ground. The well from which drinking water is obtained is located near the bottom of a steep slope and about 75 feet distant from several privies on the up-hill side, probably in the line of flow of sub-surface drainage. This well may not only have been polluted by the influence of the privy but also by the wash from the steep hill side during storms, which may gain entrance to the well from the top. The patient drank no milk and ate no raw vegetables. There were no other cases of typhoid fever in the same house or among the gang of laborers at the round house, as nearly as could be learned. The water for drinking purposes while at work was obtained from a deep well.

*Case 51.* Ramond Bonner, 535 Hayman Street. Attending physician, Dr. E. M. Ilgenfritz. Age 17. Occupation, unemployed during month previous to illness. Drank well water only. Had lived in Pittsburgh until three weeks before taking sick. Since coming to Youngstown had not been out of town. Sanitary conditions of the house and premises were in fair condition. The house is connected with neither the public water supply nor city sewers. A shallow dug well, loosely boarded over and within 50 feet of the privy, was used for drinking purposes. The patient drank no milk nor ate raw vegetables. Was said to have first felt badly a week before being taken sick. There were no other cases in the same house. Case No. 34 occurred on Foster Street, within a distance of about 100 feet and a month earlier. It is possible that the well may have been infected by the privy at the house where Case No. 34 lived. All discharges and bedding were properly disinfected during illness.

*Case 52.* Max Printz, 619 Morrison Avenue. Attending physician, Dr. W. A. Lewis. Age 30. Confined at city hospital. Occupation, blacksmith at Carnegie Steel Mill. Taken sick May 10th; died June 4th. Probably drank well water only. As far as was known had been in town for at least several months before being taken sick. No one in the neighborhood where he lived could speak English, and it was impossible to get complete information. The entire neighborhood on Morrison Avenue is in an exceedingly bad condition. Water used by the patient was obtained from a well within 30 feet of a badly constructed privy, which was filled to overflowing. There was another case (No. 49) occurring on this street a short time previously.

*Case 53.* John Flannery, 863 West Woodland Avenue. Attending physician, Dr. H. E. Welch. Age 13. Attended St. Columba's school.



Taken sick May 14th, and recovered the latter part of June. Drank well and city water. Had been in town for at least several months before being taken sick. The premises in which the patient lived were in a rather bad sanitary condition. The well from which drinking water is obtained is within 50 or 60 feet of several privies on the up-hill side. Milk was obtained from a cow belonging to the family. He ate no raw vegetables as far as was known. There were no other cases in the same house or in the same neighborhood within a distance of 500 feet. While at school the boy drank well water. Since there were several other cases using the school well occurring a few months before, this well should be regarded with suspicion. All discharges and bedding were probably disinfected during illness.

*Case 54.* Orlena Scheck, 16 West Woodland Avenue. Dr. J. S. Zimmerman. Confined at city hospital. Age 51. Occupation, kindergarten teacher at Christ's Mission School. Taken sick about May 16th; recovered June 7th. Drank both city and well water. Had been in town over a month before being taken sick. The house in which the patient lived was very neat and clean. Water at this place was obtained from a nearby drilled well. The patient boarded at a house on Oak Hill Avenue nearby, where the premises were also neat and clean. Well water was probably used. At the school it is probable that city water was drunk. The patient having moved it was impossible to get full information concerning details. Another mission teacher at the same school, case No. 45, was taken sick about a month previous. The two women lived together and had about the same habits, and it is probable that the source of infection of the two cases were the same. There were no other cases in the same house in which the patient lived or the boarding house. No cases were found among children attending Christ's Mission School.

*Case 55.* Mrs. Hawley, 328 Edwards Street. Attending physician Dr. B. W. Wilson. Age about 30. Occupation, housewife. Taken sick May 20th; recovered June 30th. Drank well water only. Had been away for two or three weeks immediately before taking sick. The house in which the patient lived as well as the surrounding ground was in a very neat and clean condition. The house is connected with the public water supply and city sewers. Water for drinking purposes is obtained from a shallow well or spring emerging at the foot of a hill composed principally of loose sandstone rock. The well is about six feet deep and is protected by a stone slab at the top. There is no immediate source of pollution within sight, but in view of the fact that the water is said to become turbid in times of heavy rains, it would appear that the spring has a direct connection with the surface of the ground. About 500 feet on the up hill side of the spring is a small abandoned quarry, in which a night soil wagon is allowed to stand during the day time. It is entirely possible for some of the night soil to get into the quarry, find its way through a fissure in the rock and thus reach the spring. The patient not being at home no details

of her habits could be learned. There occurred no other cases of typhoid fever in the same house but in the immediate vicinity there occurred a case (No. 81) a little over two months later. This case also used the spring water above described.

*Case 56.* Joe Mongino, 338 Meadows Street. Attending physician Dr. John MacCurdy. Confined at city hospital. Age 29. Occupation laborer at the Valley Mill of the Brown-Bonnell Steel Company. Taken sick May 23; recovered June 23. Drank well water only. Had been in town for at least several months before being taken sick. The premises are in rather poor sanitary condition. The house is not connected with either the public water supply or city sewers. The yard about the house is considerably littered up and unsightly. The well from which drinking water was obtained is located back of the house and within 75 feet of a privy. The well is boarded over but this does not afford perfect protection from surface pollution. The patient drank some milk. There were no other cases in the same house or among the patient's fellow workmen. However, there occurred another case (151) on the opposite side of the street, about two and one-half months later. Somewhat earlier there occurred two other cases (Nos. 28 and 35) within 500 feet.

*Case 57.* Russell Kelley, 872 Marshall Street. Attending physician, Dr. V. D. Veits. Age 13. Attended St. Columba's School. Taken sick June 6th, recovered July 4th. Drank well water only, as far as could be learned. Had been in town for at least several months before being taken sick. The premises in which he lived at the time and before having the fever were in a very neat and clean condition, and the house is connected with both the public water supply and city sewers. Well water from a well located immediately back of the house was used entirely for drinking purposes. This well is within 75 feet of several privies and within 30 or 40 feet of several large chicken coops. At school well water was drunk. As the patient had moved to another locality and could not be found detail information of his house could not be obtained. There were no other cases in the house or in the immediate neighborhood.

*Case 58.* Patrick Kelley, Flint Hill Avenue. Confined at Mahoning Valley Hospital. Attending physician, Dr. M. V. Cunningham. Age 18. Occupation weighmaster of the Republic Works of the Brown-Bonnell Steel Company. Taken sick June 10th, sick three weeks. Drank well water only. Had been in town for at least several months before being taken sick. Sanitary conditions of the house and premises as well as the whole neighborhood were in exceedingly bad condition. The house is connected with neither the public water supply nor the city sewers. The well from which water is obtained for drinking purposes is a dug well, located near the house and within 40 or 50 feet of a number of privies. It is protected by means of boards, but these can not be depended upon to prevent all pollution from entering the top. The patient drank no milk and ate no raw food as far as was known. There were no other cases in

this house or in the immediate neighborhood, though two cases (Nos. 66 and 70) occurred within 500 feet distant on Poland Avenue.

*Case 59.* Edward Leonard, 224 N. Hine Street. Attending physician, Dr. T. J. Arudel. Confined at Mahoning Valley Hospital. Age 25. Occupation, worked at factory on corner of Borman and Basin streets. Taken sick June 17, recovered about August 1st. Drank well water only. Had been in town for at least several months before being taken sick. The house in which the patient lived is a combination, grocery store and dwelling house. The house is connected with neither the public water supply nor the city sewers. The windows and doors of the house were in a very untidy condition. The well from which drinking water was obtained is a dug well and is within 75 feet of a privy. On the up hill side of the well the district is fairly well built up and all the houses are provided with privies. The patient drank very little milk and ate practically no raw vegetables. There had been no other cases in the house and the patient had heard of no other cases among men working at the factory.

*Case 60.* Margaret Byrne, 530 North Avenue. Attending physician, Dr. C. R. Clark. Confined at city hospital. Age 11. Attended St. Columba's School. Taken sick June 20th, recovered July 28th. Drank well water mainly and occasionally city water. Had been in town for at least several months before being taken sick. The house in which the patient lived was in a very neat and clean condition. It is connected with the public water supply and city sewers. The premises were also well kept. Drinking water was obtained from a well in the rear of the house, which is in a fair location as there are no privies in the immediate neighborhood. At school the child drank well water only. There were no other cases in the same house, though there occurred a number of cases within 500 to 1,000 feet to the southward. The nearest case (No. 90) occurred about a month later.

*Case 61.* Frank Bailey, 124 South Phelps Street. Attending physician, Dr. E. M. Ilgenfritz. Age 23. Occupation, dancing master. Taken sick June 25th, sick about three weeks. Drank both city and well water. Had been in town for at least several months before being taken sick. The house in which the patient lives is in the same building in which he conducts his dancing school. The premises are in a fair sanitary condition. There is no well connected with the building, the patient obtained water from wells in the immediate neighborhood, all of which are near large sewers and receive the sub-surface drainage from a large built up portion of the town. Ate but little celery and lettuce, though the patient remarked that he ate large quantities of ice cream. During several weeks before being taken sick the patient had made a number of frog hunting trips in the country. There were no other cases in the same house, though there were two other cases (Nos. 63 and 112) in the immediate neighborhood, one occurring only a short time later.

*Case 62.* Raymond Sullivan, 512 Loveless Avenue. Attending phy-

sician, Dr. R. S. Merwin. Age 15. Occupation, laborer at Youngstown Sheet Steel and Tube Company. Taken sick July 3d, recovered July 24th. Used well water only. Had been in town for at least several months before being taken sick. The house in which the patient lives is located on high ground but is in poor sanitary condition. It is not connected with the public water supply. It has a private drain which is said to lead into the city sewers, though no regular city sewer is laid in this street. In times of wet weather water from the drain, evidently containing large amounts of fecal matter, backs up into the cellar leaving a deposit of foul smelling mud. The cellar was not used for the storage of food or articles which were frequently handled and it was seldom entered. The well from which all drinking water is obtained is said to be drilled to a depth of 82 feet. It was noted that the water in the well becomes turbid after severe rains, and is said to have a bad odor and frequently contains earth worms as it comes from the pump, all indicating that there is a rather direct connection with the surface of the ground. The analysis of the water by the city chemist indicates 750 bacteria per cubic centimeter on agar at room temperature and the presence of colon bacillus in one cubic centimeter based on the absorption test in fermentation tubes. It would seem, therefore, to be subject to gross pollution. The privy which serves the house is located about 40 feet from the well and about 75 feet from the house. It is very poorly constructed and is in a poor state of repair. The vault underneath is not protected by stone and has caved in, leaving large openings on the outside. It is said the flies swarm about this place in the summer time. The kitchen being in the rear of the house, and none of the windows or doors being screened it is most likely that flies coming from the privy come in contact with food material. This would seem to be further confirmed by the fact that five other members of the family were taken sick with typhoid fever (Cases Nos. 69, 71, 72, 73, and 74) thirteen days later, and still another member (Case No. 79) fifteen days later. Strange to say there were comparatively few other cases in this neighborhood which is due in part to the sparcity of settlement, but which may also be taken to indicate that flies do not carry infection to a great distance. There were, however, two other cases (Nos. 109 and 133) which occurred later. The former having visited a neighboring house during the time the Sullivan family was sick. The other lived about a block distant. On Shelby Avenue about a block and a half distant there occurred a case (No. 125) of typhoid fever in the same house where there had been another case (No. 49) the latter occurring before the Sullivan family were taken sick. This case (No. 125) could not therefore, properly attributed to the Sullivan cases. During the illness all discharges and bedding were properly disinfected.

*Case 63.* Edward Johnson, 114 South Phelps Street. Attending physician, Dr. M. V. Cunningham. Age 6. Stayed at home. Taken sick July 4th, recovered July 25th. Drank well water only. Had been



in town for at least several months before being taken sick. The house is located on low ground in the central portion of the town, and is next to a livery stable and both the house and premises are in a bad sanitary condition. It is not connected with either the public water supply or city sewers, though there is a city hydrant in the neighboring yard. The house is said to have been screened during the summer time, but the effectiveness of the screens in keeping out flies is doubtful. The well from which all drinking water was obtained is a shallow dug well on the corner of Phelps and Boardman streets, and analysis of a sample taken from this well indicate it to be dangerously polluted. The child drank no milk and ate no raw vegetables and is said to have eaten little ice cream or other foods which might possibly carry typhoid infection. There were no other cases in the same house or among the child's playmates. There were, however, two cases (Nos 61 and 112) in the immediate neighborhood, both of which had drunk water from the above described well. All discharges and bedding were properly disinfected during illness.

*Case 64.* R. H. Roderick, corner Parmlee and Harmony streets. Attending physician, Dr. J. K. Hamilton. Age 50. Occupation, iron worker at the fire proofing works, located a short distance outside of the city limits to the northwest. Taken sick July 8th, recovered July 30th. Drank both well and city water. Had been in town for at least several months before being taken sick. The house in which the patient lives is in a neat and clean condition as is the surrounding yard. The house is not connected with the city sewers but is connected with the public water supply. The well from which most of the drinking water is obtained is located in the rear of the house and is said to be a drilled well 56 feet in depth. There had been no other cases among the patient's fellow workmen as far as could be learned, nor had there been any other cases of typhoid fever in the neighborhood in which the patient lives. The patient's habits were good. He was around town more or less and may have received the infection elsewhere than at his home or the works. All discharges and bedding were properly disinfected during illness.

*Case 65.* Emma Weeden, 125 Jefferson Street. Attending physician, Dr. W. J. Ritchie. Age 20. Occupation, domestic. Taken sick July 8th, recovered August 17th. Drank both well and city water. Had been in town for at least several months before being taken sick. The house and premises of the patient's home were in a fairly neat and clean condition. The house is not connected with either the public water supply or city sewers. The well from which drinking water was obtained is a dug well 30 feet deep and within 50 feet of the privy, the latter being on the up hill side. The patient was at home on Thursdays and Sundays only. She served as domestic at 374 Custer Avenue, at this place she drank principally city water, though occasionally drank some well water from a neighboring well. The premises here are very neat and clean. The patient drank but little milk and ate no raw vegetables. At her home or



the place where she served as domestic there were no other cases of typhoid. Neither were there any cases in the neighborhood of either place. During sickness no disinfectants were used. The case was very mild and may not have been typhoid fever.

*Case 66.* Mabel Rider, 623 Poland Avenue. Attending physician, Dr. L. B. Smith. Age 13. Attended South Avenue school. Taken sick July 9th, recovered August 9th. Drank well water only. Had been in town for at least several months before being taken sick. The house in which the patient lives is located on low ground adjacent to the river and is in fair sanitary condition. It is connected with neither the public water supply nor city sewers. The well from which drinking water is obtained is located on the premises, is drilled and said to be 76 feet deep, the casing extending down to a depth of 42 feet. Within 75 feet of the well is the privy. It is not known through what formation the well extends, but probably strikes rock at 40 feet. The child drank milk which was obtained from a dairy at 622 Poland Avenue, immediately across the street. This place was visited and found to be in an exceedingly filthy condition. The stable in which cows are kept is small and dark and apparently never cleaned. Garbage and sink drainage are freely distributed over the ground. The privies are poorly constructed and were filled to overflowing. The appearance of the occupants of the house was in general keeping with the surroundings. The mother of Mabel Rider who attended her during the early stages of the illness was herself taken sick with typhoid fever (Case No. 70) one week later. All discharges and bedding were properly disinfected during illness.

*Case 67.* Robert Riddell, 21 Clark Street. Attending physician, Dr. Shaffer. Age 16. Occupation, attended refreshment stand at Idora Park. Drank well water only. Had been in town at least several months before being taken sick. The house in which the patient lived is located on low ground adjacent to the river. It is in fair sanitary condition and is connected with both the public water supply and city sewers. Water used for drinking purposes is obtained from a shallow dug well located within 40 feet of several privies. The patient was at the park most of the day and ate most of his meals there. While at the park he ate considerable quantities of ice cream. There were no other cases in the same house or in the immediate neighborhood, during the present year. There had been cases, however, on this street during previous years. All discharges and bedding were properly disinfected during illness.

*Case 68.* William Gibbon, 51 North Hine Street. Attending physician, Dr. C. M. Klyne. Age 12. Occupation, delivered papers but was at home most of the time. Taken sick July 16th, recovered August 12th. Drank both city and well water. Had been in town for at least several months before being taken sick. The house is in fair sanitary condition and is connected with the public water supply but not with the city sewers. During the summer time the house was fairly well screened. The child

was known to drink Wheeler Spring water and city water while at home. It is also probable that he drank from the well on the corner of Boardman and Phelps streets, or from one of the several public wells. The boy was also known to buy a number of ice cream sandwiches from street venders. Frequently during the summer time and before being taken sick he went bathing in the Mahoning River. There were no other cases in the same house, though there was one case (No. 36) in the same neighborhood, within half a block, occurring about two months previously. During illness all discharges and bedding were properly disinfected.

*Case 69.* Mrs. Lizzie Sullivan, 612 Loveless Avenue. Attending physician, Dr. F. S. Merwin. Confined at city hospital. Age 37. Occupation, housewife. Taken sick July 16th, recovered August 27th. Drank well water only. Had been in Johnstown, Pennsylvania, from July 2nd to July 9th, but was feeling badly before going. Had been in contact with no cases of typhoid fever while at Johnstown. The son, Raymond, was taken sick on July 3rd, thirteen days previously. For details of the sanitary conditions of the house, well, privy and probable source of infection see Case No. 62.

*Case 70.* Mrs. Anna Rider, 623 Poland Avenue. Attending physician Dr. L. B. Smith. Age 31. Occupation, housewife. Taken sick July 16th, recovered August 27th. Had been feeling badly for a week or so before going to bed. Drank well water only. Had been in town for at least several months before being taken sick. The daughter was taken sick July 9th. It is quite probable that the two were infected at about the same time. For details of sanitary condition of premises and probable source of infection see Case No. 66.

*Case 71.* Nellie Sullivan, 612 Loveless Avenue. Attending physician, Dr. F. S. Merwin. Confined at city hospital. Age 16. Occupation, employed at Ohio Rubber Plant. Taken sick July 16th, recovered August 27th. Drank well water only. Had been in town for at least several months before being taken sick. For description of the sanitary conditions of the premises and probable source of infection see Case No. 62.

*Case 72.* Elmer Sullivan, 612 Loveless Avenue. Attending physician, Dr. F. S. Merwin. Confined at city hospital. Age 8. Occupation, stayed at home. Taken sick July 16th, recovered August 7th. Drank well water only. Had been in town for at least several months before being taken sick. For description of sanitary conditions of premises and probable source of infection see Case No. 62.

*Case 73.* Marelda Sullivan, 612 Loveless Avenue. Attending physician, Dr. F. S. Merwin. Confined at city hospital. Aged 13. Occupation, stayed at home. Taken sick July 16th, recovered August 27th. Drank well water only. Had been in town for at least several months before being taken sick. For description of sanitary conditions of premises and probable source of infection see Case No. 62.

*Case 74.* Pearl Sullivan, 612 Loveless Avenue. Attending physi-

cian, Dr. F. S. Merwin. Confined at city hospital. Age 6. Stayed at home. Taken sick July 18th, recovered August 27th. Drank well water only. Had been in town for at least several months before being taken sick. For description of sanitary conditions of premises and probable source of infection see Case No. 62.

*Case 75.* John Casey, 24 Hamburg Street. Attending physician, Dr. J. B. Kotheimer. Age 15. Occupation, school boy. Had been at home since the close of school. Taken sick July 21st, recovered September 3d. Drank well water only. Had been in town for at least several months before being taken sick. The sanitary conditions of the house were poor and it is not connected with the public water supply or city sewers. The surroundings of the house are also in bad condition, the yard was littered with all sorts of rubbish and sink drainage flowed over the surface of the ground. The well from which drinking water is obtained is located in the rear of the house. It is a deep dug well, is poorly protected at the top, and is within 100 feet of several privies. The sub-surface drainage from the privies, as indicated by the configuration of the ground, is probably in a direction away from the well. The boy drank but little milk and this was obtained from the family cow. As far as could be learned he had eaten no raw vegetables or other food which might possibly carry infection. Before being taken sick he went bathing in the Mahoning River every day. There were no other cases in the same house during the present year, though there had occurred some in previous years. There were no other cases among the boy's associates. There was one other case (No. 50) in the same neighborhood about a block removed and in an uphill direction. The case recovered the first of June. All discharges and bedding were properly disinfected during illness.

*Case 76.* Frank Williams, 337 School Street. Attending physician, Dr. J. A. Sherbondy. Age 31. Occupation, saloon keeper, at 12 Oak Hill Avenue. Taken sick July 21st, recovered August 21st. Drank well water and seltzer water only. Had been in town for at least several months before being taken sick, though he had made one or two trips into the country for part of a day before feeling badly. The house in which the patient lived was in a very neat and clean condition. It is not connected with the public water supply but is connected with the city sewers. The windows and doors are well provided with screens. The saloon is connected with both the public water supply and city sewers. At home he drank water obtained from a 28-foot dug well, said to be in a gravel deposit, and is within 100 feet of a privy. At the saloon the patient drank only seltzer water and buttermilk. The milk supply used at home was obtained from F. Weber & Co. While away in the country the patient ate cheese sandwiches and drank beer. There were no other cases in the immediate neighborhood and the patient does not remember of having come in contact with any person having typhoid fever. The nearest case (No. 11)

is about a block removed on the down hill side and occurring in the early part of the year.

*Case 77.* Thomas Waters, 737 Albert Street. Attending physicians, Drs. J. F. Kenney and C. D. Hauser. Age 23. Occupation, oiler and painter in the American Belt Works in the northwestern part of the city. Taken sick July 22nd, recovered September 20th. Drank well water only. Had been in Buffalo from June 15th to June 20th, that is a month before being taken sick, so that the infection was probably obtained in Youngstown. The premises were in a neat and clean condition. The house is not connected with the public water supply or city sewers. The windows and doors were well screened. The yard about the house was somewhat littered with rubbish, but could not be considered in a bad sanitary condition. Water for drinking purposes is obtained from a 35 foot dug well in the gravel, poorly protected at the top, has loose laid walls and is within 50 feet of three privies. Milk was obtained from Hayes dairy during the month before the patient was taken sick. The patient ate more or less ice cream and some lettuce and celery, but as far as could be learned had eaten no other foods that would be a probable source of infection. It was claimed by the patient that he drank city water at the works, but that is probably a mistake as no city mains extend to the works. All discharges and bedding were properly disinfected during illness.

*Case 78.* Henrietta Young, 425 Pyatt Street. Attending physician, Dr. C. H. Klyne. Age 6. Stayed at home. Taken sick July 22, sick two weeks. Very mild case. Drank both city and well water, principally well water. Had been in town for at least one month previous to being taken sick. Sanitary conditions of the premises were fair. The house is connected with both public water supply and city sewers, but the old fashioned privy is still maintained in the rear of the house. The windows and doors are not provided with screens. Nearly all the water used for drinking purposes was obtained from a dug well in the rear of the house and within about 50 feet of the privy. There were no other cases in the same house during the present year, though there had occurred other cases in the immediate neighborhood during previous years. No other cases occurred within a considerable distance during the present year. Milk was obtained from the Hass dairy. The child never ate raw food and as far as could be learned no other food that might carry typhoid infection. The child was sickly and was said to have been feeling badly for several months before actually going to bed. All discharges and bedding were properly disinfected during illness.

*Case 79.* Thomas Sullivan, 612 Loveless Avenue. Attending physician, Dr. F. S. Merwin. Confined at city hospital. Age 4. Taken sick July 26th, recovered August 27th. Drank well water only. Had been in town for at least several months before being taken sick. For description of sanitary conditions of the premises and probable source of infection see Case No. 62.



*Case 80.* William Whitford, 328 North Avenue. Attending physician, Dr. D. W. Baker. Confined at city hospital. Age 22. Occupation, conductor on city street cars. Taken sick August 2nd, still sick at time of investigation. Drank well water only. Had been in town for at least several months before being taken sick. At the house where the patient lived the sanitary conditions were good. The house is connected with the public water supply and city sewers. Water for drinking purposes is obtained from a 60-foot drilled well in the rear of the house, within 100 feet of several privies. The patient boarded at the house of Mrs. M. J. Taylor, 426 Thomas Street. At this house another boarder (Case No. 97) was taken sick six days later, and the landlady (Case No. 105) was taken sick fifteen days later. The well water at the boarding house was obtained from a very shallow dug well on one side of the house and within 30 feet of the privy belonging to the house next door, where there is said to have been a case of typhoid fever during the present year. As the parties occupying this house had moved and as the case had not been reported it was impossible to verify this statement or get details of the circumstances. However, if the case existed it is very easy to explain the pollution of the well and the consequent infection of the people boarding next door. Analysis of the well indicates the water to be grossly polluted with decomposing organic matter. The patient also drank considerable water from the public well in the public square. As far as could be learned the patient drank but little milk, and ate no raw food that might have produced the disease. He was generally of a delicate constitution.

*Case 81.* Mary E. Smart, 908 Granite Street. Attending physician, Dr. J. S. Zimmerman. Age 28. Occupation, housewife. Taken sick August 2d, recovered October 6th. Drank well water only. Had been in town for at least several months before being taken sick. The house in which the patient lived was in a neat and clean condition and well screened. The house is connected with both the public water supply and city sewers. The public water supply, however, was never used for drinking purposes. All water being obtained from a shallow well or spring located at the foot of a hill composed principally of loose sandstone rock, and this spring in times of heavy rains becomes turbid indicating that it has a rather direct connection with the surface of the ground. There are a few privies on the hill above the house at a considerable distance away. At a short distance, however, there is a small quarry, not being worked, in which a night soil wagon stands during the day time. It is quite possible that material from this wagon could have been washed through the crevices of the rock into the spring. This spring was used also by another person (Case 55) who was taken sick with typhoid fever, a little over three months before. There were no other cases in the same house and only one other in the immediate neighborhood, namely that referred to. About two blocks distant and high up on the hill and perhaps in the line of sub-surface drainage there occurred another case (No. 38) which



recovered the latter part of June. The patient drank milk from various dairies and ate practically no raw food that might have carried the infection. All discharges and bedding were properly disinfected during illness.

*Case 82.* Miss Morgan, southeast corner of North Avenue and Thomas Street. Attending physician, Dr. E. W. Coe. Age 25. Occupation, telephone operator. Taken sick August 3rd, sick about three weeks. As near as could be learned well water only was used for drinking purposes. Had been in town at least several months before being taken sick. The house was in a neat and clean condition and well screened. The yard in the rear of the house, as well as a number of other yards in this neighborhood, was in a very bad sanitary condition. The yard is at the edge of a small valley which extends in a general north and south direction towards which most of the sub-surface drainage from this thickly built up portion probably flows. The well from which drinking water was obtained is located in this valley and probably corresponds in quality to that at number 426 Thomas Street, just across the street where several cases of typhoid fever were most likely contracted from the use of well water at that place. No one was at home at the time of the investigation and the personal habits of the patient could not be ascertained in any detail. All discharges and bedding were properly disinfected during illness.

*Case 83.* Scanland Owen, 625 Erie Street. Attending physician, Dr. A. S. Green. Age 18. Occupation, machinist at the William Todd Company's plant. Taken sick about August 5th, recovered September 14th. Drank well water and cistern water only. Had been in town for at least several months before taking sick. The house in which patient lived was in a neat, clean condition and is well screened during the summer. It is connected with both the public water supply and city sewers. The city water is not used for drinking purposes, drinking water being obtained from a drilled well said to be somewhat over 60 feet deep and located just to the rear of the house. The house itself has no outside privy, but there are a number in the neighborhood and on the up-hill side of the well, the nearest being 75 feet distant. A cistern for catching rainwater is also located at the rear of the house, and this water is sometimes used for drinking purposes. It is claimed that no other water is used at the William Todd Company's works but Wheeler spring water. The patient drank no milk and ate practically no raw foods that might have carried the infection. His habits were regular, though he visited about town more or less. During his illness all discharges and bedding were said to have been properly disinfected.

*Case 84.* Tillie Zahlkind, 125 Prospect Street. Attending physician, Dr. H. E. Welch. Confined at city hospital. Age 17. Occupation, dress-maker in Scotch Woolen Mills. Taken sick August 6th, died August 17th. Drank well water so far as could be learned. Had been in town for at least several months before being taken sick. The house was in fairly

clean condition and is screened during the summer time, though the effectiveness of the screens is doubtful. It is not connected with either the public water supply or the city sewers. Water for drinking purposes was obtained from a well alongside of the house and within 100 feet of privies which are on the up-hill side. The depth or character of the well is not known. In addition to the privies there is a rather dense population farther up the hill, which may also add to the pollution of the well. While at work it is possible that the patient may have used city water for drinking purposes, though it is believed that a well on the premises was generally used. Milk was obtained from the Early Road dairy; little of this, however, was drunk before the patient was taken sick. The patient ate no raw foods that might have carried the infection. There were no other cases in the immediate neighborhood, though a short time before there occurred a case (No. 68) about a block removed and on the down-hill side.

*Case 85.* Mary Benjula, 1845 Cherry Street. Attending physician, Dr. F. H. Simpson. Age 9. Stayed at home. Taken sick about August 9th; was sick about four weeks. Drank well water only. Had been in town at least several months before taking sick. The house in which patient lived was in a very unsanitary condition, as are the surrounding premises, and is not screened during the summer time. The house is not connected with the public water supply or city sewers. Water for drinking purposes is obtained from a shallow well at the rear of the house and within about 50 feet of several privies. The entire neighborhood is built on low ground, apparently of gravelly material, and the houses and privies are very close together. Milk was obtained from the family's own cow, kept in a dirty and dilapidated stable. There were no other cases in the same house or in the same neighborhood so far as could be learned. A few other cases were reported in this general locality, but they could not be found. It was claimed that all discharges and bedding were properly disinfected during illness.

*Case 86.* Joe Kelley, 23 Valley Street. Attending physician, Dr. M. V. Cunningham. Age 8. School boy at home during vacation. Taken sick about August 7th, recovered August 28th. Drank well water only. Had been in town for at least several months before taking sick. The house in which patient lived was in a rather untidy condition. The premises in general were dirty and littered with refuse. Water for drinking purposes was obtained from one or the other of two shallow dug wells, both of which were within 40 feet of privies. The well nearest the house was analyzed and found to be grossly polluted with decomposing organic matter. Patient drank no milk, but was occasionally known to drink buttermilk that was procured from next door neighbors. About two weeks before being taken sick had eaten considerable ice cream obtained from Monroe's grocery store on Valley Street—a rather dirty place. There

were no cases among friends of the patient previous to the time he was taken ill. There occurred, however, four other cases in the immediate neighborhood sometime later (Nos. 121, 126, 132 and 134), all within a radius of about 400 feet. It was claimed that all discharges and bedding were properly disinfected during illness. The condition of the privies adjoining the house was such as to make the probability very strong of infection being carried by flies.

*Case 87.* Marie Baun, 487 Edward Street. Attending physician, Dr. Shaffer. Age 15. Occupation, milliner in Central Store on East Federal Street. Taken sick about August 7th; recovered in the latter part of August. Drank well water only. Had been in town for at least several months before being taken sick. A month or so before taking sick patient had not been at the store, but had been employed as domestic for part of the time on New Court Street, where well water was also used for drinking purposes. The house is on rather elevated ground, but lies below a fairly large built-up district. The premises were exceedingly neat and clean. Water for drinking purposes was obtained from a well 34 feet in depth and said to be entirely in rock. Privies are about 60 feet from this well. Sink drainage from the house is allowed to run in a small gutter very near the well. Patient drank but little milk and ate practically no raw food that might have carried the typhoid infection. The only other case (No. 53) nearby was a block distant on the up-hill side. This case occurred in the latter part of May and the early part of June. According to the general slope of the ground, this case would appear to be in a direct line with the underground flow of water. It is claimed that all discharges and bedding were properly disinfected during illness.

*Case 88.* Isabella Jones, 753 Elm Street. Attending physician, Dr. W. E. Ranz. Age 4. Taken sick about August 12th; sick about three weeks. Drank both well and city water. Patient had been in town for at least several months before being taken sick, except for a short visit of a few days to Girard where she first began to complain. The house was very neat and clean and is connected with both the public water supply and city sewers. The windows and doors are well screened in summer. The well is a dug well 32 feet deep, protected with a wooden cover and is within 70 feet of privies. Child did not drink a great deal of milk; such as she did have was obtained from the Hayes dairy on Madison Avenue about a block away. Child ate considerable ice cream which was procured from various sources. There occurred no other cases in the neighborhood, though at a later date, September 8th, there occurred a case (No. 131) at the residence of the milk dealer, Hayes.

*Case 89.* J. W. Waddington, 29 Arcadia Court. Attending physicians, Drs. McCurdy and Evans. Age 32. Occupation, driver of delivery wagon for Guthman's furniture store. Taken sick August 12th; recovered September 13th. Used both well and city water. Had been in town for at least several months before being taken sick, except for a visit of four

days, just before taking sick, to Beaver, Pa. The house in which patient lived was neat and clean and the windows and doors were well screened. The house is connected with the city sewers but not with the public water supply. Water for drinking purposes was obtained from two wells, one at each end of Arcadia Court. The well at the entrance to the court was sampled and found to contain evidence of past pollution, more particularly in the number of bacteria present, but at the time of sampling could not be said to be in a dangerous condition. The other well was within 100 feet of privies and was probably more dangerously polluted, though no analysis was made. At Guthman's furniture store both city water and water obtained from a mineral spring were used for drinking purposes. The patient, however, on account of his business was taken to all parts of the city and sometimes outside of the corporation and drank water from various sources. At home he occasionally drank milk which was obtained from G. W. Rider's dairy. Practically no raw foods were eaten which might have carried typhoid infection. There have been no other cases in the same house during the present year, but numerous cases have occurred in previous years. The general locality in and about Arcadia Court has always had a number of typhoid cases, and during the present year there have occurred in this neighborhood six other cases (Nos. 40, 41, 106, 110, 115 and 122) about which full information was obtained. There was one other case, but no detailed information could be had as the patient was away from home.

*Case 90.* Agnes Kelly, 530 Burnett Street. Attending physician, Dr. Shaffer. Age 4. Taken sick August 13th; recovered August 27th. Drank well water only. Had been in town at least several months before taking sick. The house was in a fairly neat and clean condition. The windows and doors are not screened during the summer time. The house is connected with neither the public water supply nor the city sewers. The yard at the rear of the house was somewhat untidy and littered with refuse. Through it passes an open ditch containing sink drainage and overflows from several privies. The water in places stands in stagnant pools. The well from which drinking water was obtained is within 30 feet of the drain and within 50 feet of several privies. Drank a moderate amount of milk which was obtained from Weir and Thompson's dairy. So far as could be learned the patient ate no raw foods which might have carried the typhoid infection. There were a number of other cases in this general neighborhood. There were no other cases in the same house, though there were seven other children in the family. It is quite probable that this as well as some of the other cases in the neighborhood were a result of fly infection.

*Case 91.* Mike Pebo, 1136 Hezler Street. Attending physician, Dr. W. J. Ritchie. Age 23. Occupation, laborer at the Republic Works of the Brown-Bonnell Steel Company. Taken sick August 13th; recovered September 22nd. Drank well water only. Had been in town for at least



several months before taking sick. The house was in a very dirty and untidy condition and is connected with neither the public water supply nor the city sewers. There are no screens in doors and windows during the summer time. The premises surrounding the house are also maintained in an untidy condition, the ground being littered with refuse. Water for drinking purposes was obtained from a well in front of the house. This well is apparently a shallow dug well and finds its supply in gravelly soil. It is boarded over and washing of clothes is carried on on top of the well covering. The privies are located at the rear of the house, about 100 feet distant from the well, but in line with the flow of underground water toward the well. Chemical analysis of a sample from this well indicates the presence of pollution from decomposing organic matter, but at the time of sampling the water was not as bad as might be anticipated from the surroundings. Drank but little milk and such as was used was obtained from a cow belonging to the family. Ate no raw foods, so far as could be learned, that might have carried the typhoid infection. There were no other cases in this house during the present year, but two cases occurred in the next house (Nos. 144 and 145) on September 14th. Both of these cases drank water from the same well. Otherwise, there were no cases in this immediate neighborhood. It is claimed that during illness all discharges and bedding were properly disinfected.

*Case 92.* Rebecca Saville, 935 Starr Street. Attending physician, Dr. M. V. Cunningham. Confined at city hospital. Age 21. Occupation, domestic. Taken sick August 14th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The house is located on high ground and is in rather poor sanitary condition; it is connected with neither the public water supply nor the city sewers. The doors and windows are not screened during the summer time. Water for drinking purposes was obtained from a dug well at the rear of the house, within 50 feet of the privy. The washing for Case 77 was done in this house. It is possible that the infection may have been taken in this way. For two weeks before taking sick the patient worked at the Republic Rubber Works, where the water used for drinking purposes is obtained from a spring. Patient drank no milk. Lettuce was occasionally eaten and was obtained from a garden on the premises. There was another case (patient's small brother) in the same house and occurring at the same time, indicating the two to have come from the same source of infection. In the neighborhood there was one other case (No. 142) about a half block distant, which occurred a few weeks later, viz., September 3rd.

*Case 93.* George Saville, 935 Starr Street. Attending physician, Dr. M. V. Cunningham. Age 6. Stayed at home. Taken sick August 15th; recovered September 7th. Drank well water only. Had been in town for at least several months before taking sick. For further information



concerning sanitary condition of premises and possible sources of infection, see Case 92.

*Case 94.* Lewis Truebe. 342 Harvard Street. Attending physician, Dr. W. J. Ritchie. Age 16. Occupation, worked in upper mills of the Carnegie Steel Company. Taken sick August 15th; died August 25th. Drank well water only. About four weeks before taking sick went to Cleveland on an excursion; otherwise had been in town continuously. The house, as well as the premises, was in a very neat and clean condition. It is not connected with either the public water supply or city sewers. During the summer time the windows and doors are well screened. Water for drinking purposes at the home was obtained from a drilled well said to be 64 feet deep and passing through blue clay, sandstone, coal and sandstone in the order named. It is claimed that water from the well had been analyzed chemically and had been pronounced of good quality. Within 25 feet of the well is a privy. At the works well water was drunk, but, as indicated by the inspection of this well, this is probably of good quality. There were no other cases during the present year in the same neighborhood, nor among the friends or associates of the patient. His habits were regular, and other than going to Cleveland, he had been nowhere except at home and at the works. It is very doubtful whether this case was typhoid. During the illness no disinfectants were used.

*Case 95.* Ella Funchon. 1226 Maple Avenue. Attending physician, Dr. M. V. Cunningham. Confined at city hospital. Age 14. Stayed at home. Taken sick August 15th; recovered September 17th. Drank well water only. Had been in town for at least several months before taking sick. The house is on rather high ground, on the edge of the built-up portion of the town and somewhat isolated from other houses. It is connected with neither the public water supply nor the city sewers. Windows and doors are not screened during the summer. The interior, as well as the surroundings, was in a slovenly, untidy condition. Water for drinking purposes was obtained from a shallow dug well within about 75 feet of a privy. This privy, however, is not in what would probably be the line of underground flow, and otherwise it is impossible to see how this well could have been polluted. The milk supplied was obtained from a Mrs. Huck, a neighbor, who kept a cow. The patient drank but very little milk, and so far as could be learned ate no raw foods that might have carried the typhoid infection. There were no other cases in the immediate neighborhood, though at a distance of a few blocks there were several cases that had occurred a short time before, the nearest of these being No. 77. It is possible that the patient might have visited neighbors who used polluted wells, or the case may be one of fly infection. [It has been learned since that another case recently occurred in this house.]

*Case 96.* Louis Delozier. 214 West Front Street. Treated at

Mahoning Valley Hospital. Age 23. Occupation, freightman in Lake Shore freight yards. Taken sick August 15th; sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The house in which patient was a boarder was in fairly clean condition and is connected with both the public water supply and city sewers. Water for drinking purposes was obtained from a dug well (depth unknown) at the rear of the house on Boardman Street and located within about 60 feet of several privies. Patient drank no milk and ate no raw foods, so far as could be learned, that might have carried the typhoid infection. At work water was obtained from a well in the freight yards which is said to be of good quality. There were no other cases in the same house or among the fellow-workmen of the patient. There were, however, three other cases in the neighborhood about a block removed, Nos. 61, 63 and 112. Two of these occurred a few weeks previously and the other a few weeks later.

*Case 97.* Bert Marshall. 126 Scott Street. Treated at city hospital. Age 24. Occupation, conductor on Mahoning Valley street car. Taken sick August 16th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before being taken sick. The patient when at home at 126 Scott Street drank well water. At his boarding house (426 Thomas Street) well water was also used for drinking purposes, the well being located within about 25 feet of a privy belonging to a neighboring house in which there had previously been a case of typhoid fever. For details of sanitary condition of premises and probable cause of infection see Case 105. There were two other cases in this house, one (No. 80) occurring six days previously and the other (No. 105) occurring nine days later. While at work the patient drank from wells, principally from the public well on the city square. There were no other cases at the house where the patient roomed.

*Case 98.* Mary Menahan. 137 Ayers Street. Attending physician, Dr. William H. Taylor. Age 12. School girl at home during vacation. Taken sick August 17th; recovered September 18th. Drank well water only. Had been in town for at least several months before being taken sick. The house in which the patient lived is on fairly high ground, but the surroundings are in a bad sanitary condition. The house is neither connected with the public water supply nor the city sewers. During summer no screens are provided for windows and doors. The yard surrounding the house is considerably littered with refuse and sink drainage is allowed to run over the surface of the ground. The well from which drinking water was obtained is said to be a deep drilled well and is 70 feet from privies. Milk was obtained from Gilkenson's dairy. Child ate no raw food, so far as is known, that might have carried the typhoid infection. There occurred two other cases in this

neighborhood, one (No. 5) in the early part of the year, and the other toward the last of July, the latter case being imported from Niles. During illness all discharges and bedding are said to have been properly disinfected.

*Case 99.* Joseph Vincent Seefried. 230 Hughes Street. Attending physician, Dr. J. S. Zimmerman. Confined at city hospital. Age 24. Occupation, machinist at the William Pollock Works. Taken sick August 17th; recovered September 14th. Drank both well and city water. Had been in town for at least several months before taking sick, though he had made a short excursion trip to Niagara Falls perhaps three or four weeks before going to bed. Roomed only at above address, and is not supposed to have drunk much water there: such as was used was from the public supply. The premises here were exceedingly neat and clean. As a rule the patient ate at a restaurant on East Federal Street, the name of which could not be learned. The patient could not be found, and as he had moved several times since taking sick, it was impossible to get more detailed information regarding his personal habits.

*Case 100.* Andrew Drotell. 213 East Boardman Street. Treated at city hospital. Age 25. Occupation, tailor with Conway and Hannon on West Federal Street. Taken sick August 18th; still sick at time of investigation. Drank both well and city water. Had been in town for at least several months before taking sick. While at home drank water from a well on the corner of Boardman and East Walnut streets. This is a shallow dug well, in a thickly built-up neighborhood, and within 100 feet of several privies. It is poorly protected at the top and the ground surrounding it is more or less littered with refuse. On both streets there is a city sewer not more than 40 or 50 feet from the well. There were two other cases in this neighborhood, one (No. 129) of which drank water from the same well; the other (No. 119) lived immediately across the street, but used water from another well, which is apparently polluted. The whole neighborhood in this vicinity is in very unsanitary condition.

*Case 101.* Herman Siefert. Hotel Wilson, on Himrod Avenue. Attending physician, Dr. C. D. Hauser. Age 28. Occupation, worked at freight station of the Pennsylvania Railroad. Taken sick August 18th; recovered September 18th. Mild case. Said to have used only well water. Had been living in town for at least several months before taking sick, but was in the habit of visiting relatives in the country near Youngstown several days each week. The water used for drinking purposes at his place of residence was obtained from a spring located in the cellar of the building. This spring is open at the top and is encased in a length of 24-inch vitrified pipe. It is several feet deep. The hotel is in fairly clean condition and is connected with both the public water supply and city sewers; but the city water, it is claimed, is never used

for drinking purposes While at work well water was furnished to the men from a flowing well on Augusta Street. This water seems to be the same as that furnished by the Wheeler spring, and is indicated by the analysis to be of fair quality. There was one other case (No. 136) in the hotel, occurring in the early part of September. On the up-hill side of the hotel and in a direction from which the spring may receive sub-surface drainage there were a few other cases (Nos. 36, 68 and 84) from a block to a block and a half distant. There were no cases among the workmen at the freight station.

*Case 102.* Matilda Law. 344 Foster Street. Attending physician, Dr. J. Allen Cross. Age 9. School girl at home during vacation. Taken sick August 18th; still sick at the time of investigation. Drank well water only. Had been in town for at least several months before being taken sick. The house in which patient lived is not connected with either the public water supply or city sewers. The house and surrounding premises were in fairly sanitary condition. Water was obtained from a dug well within about 50 feet of a privy. Milk was procured from the Rees Brothers dairy. The patient ate no raw foods, so far as is known, that might have carried typhoid infection. The mother of the child was taken sick with typhoid fever on September 19th, just about a month after the child's illness began. The mother had attended the child during the latter's illness. In the same neighborhood, within a block distant, there were four other cases (Nos. 60, 90, 123 and 153). During the illness, it is claimed that all discharges and bedding were properly disinfected.

*Case 103.* Richard Bailey. 641 Erie Street. Attending physician, Dr. E. H. Hake. Age 5. Taken sick August 21st; recovered September 13th. Drank both well water and city water. Had been in town for at least several months before taking sick. The house was in a very neat, clean condition. The windows and doors are screened during the summer-time, and it is said that flies are fairly well kept out of the house. Near the house there are several privies which cause a considerable nuisance during certain portions of the year. Water for drinking purposes was obtained from two dug wells, one being within 50 feet of three privies and the other within 70 feet of one privy. Both wells are well protected at the top and are generally believed to be of good quality. The child drank but little milk; such as it did have was obtained from D. P. Soustons dairy. Occasionally ice-cream was eaten but no other foods that might have carried the typhoid infection. There were no other cases in the same house, though there had been another case (No. 83), occurring in the same month, three doors distant. During illness all discharges and bedding are said to have been properly disinfected.

*Case 104.* Charlotte McGahagan. 1009 Arch Street. Attending physician, Dr. M. V. Cunningham. Age 23. Occupation, tailoress with D. M. Mansen in Mahoning Block. Taken sick August 22nd; recovered



September 3rd. Drank both well and city water. Had been in Butler, Pa. from August 9th to August 16th. The house in which patient lived was very neat and clean, though the yard at the rear of the house was rather littered with refuse, and sink drainage was allowed to flow over the surface of the ground. The house is connected with neither the public water supply nor the city sewers. Windows and doors were well screened and great care was taken to prevent the entrance of flies. Water for drinking purposes was obtained entirely from a dug well within 50 feet of the privy. The privy, being on the down-hill side, probably drains in the opposite direction. The patient ate considerable lettuce and celery and occasionally ice-cream. While at work the patient is said to have drunk city water. There were no other cases in the same house or in the shop in which patient worked. Five other cases (Nos. 86, 121, 126, 132 and 134) occurred from a block to a block and a half toward the northwest on Valley Street. The whole neighborhood in this vicinity is in very unsanitary condition. During illness all discharges and bedding were properly disinfected.

*Case 105.* Mrs. M. J. Taylor. 426 Thomas Street. Attending physician, Dr. E. W. Coe. Age 45. Occupation, boarding house keeper. Taken sick August 25th; recovered September 27th. Drank well water only. Had been in town for at least several months before being taken sick. Premises were in fairly neat and clean condition. The house is not connected with either the public water supply or the city sewers. Windows and doors are screened during the summer-time, but the screens are not very effective. Water for drinking purposes was obtained from a shallow dug well at the side of the house and within about 25 feet of a privy belonging to the neighboring house in which there had been a case of typhoid fever a short time before. The well, in addition to being near the privy, is located in a small valley running in a general north and south direction and which would naturally receive the sub-surface drainage of a thickly built-up district, most of the houses in which have outdoor privies. But little could be learned of the food eaten by the patient, though it is probable that she ate little that might have carried the typhoid infection. There were two other cases (Nos. 80 and 97) among boarders in the same house; these patients were taken sick twenty-five and seven days previously, respectively. There also occurred quite a number of cases (Nos. 22, 23, 48, 60, 90 and 80) in this neighborhood, most of which were just to the westward. During illness all discharges and bedding are said to have been properly disinfected.

*Case 106.* William Behnke. 14 Arcadia Court. Attending physician Dr. Shaffer. Age 28. Occupation, fireman on Pennsylvania Railroad shifting engine. Taken sick August 27th; recovered September 15th. Case very mild. Drank both well and city water. Had been in town for at least several months before taking sick, though the engine on which patient acted as fireman frequently went beyond the city limits.



The house in which the patient lived presented a neat and clean appearance, and the doors and windows are screened during the summer; it is connected with both the public water supply and the city sewers. All water for drinking purposes was obtained from a well at the entrance to Arcadia Court, the analysis of which indicates it to be of doubtful quality; though at the time of sampling it could not be said to be dangerously polluted. While at work patient drank water from various sources along the railroad, principally, however, well waters. Milk was obtained from A. Webber & Company's dairy. Patient ate no raw foods, so far as was known, that might have carried the typhoid infection. There were no other cases among workers on the railroad so far as is known. There did occur a great many cases (Nos. 40, 41, 89, 110, 115 and 122) in this immediate neighborhood, which has always had more or less typhoid fever, and it is probable that a number of the wells used are badly polluted. The soil is of a gravelly nature and very little above the level of the river. Two large sewers run through the district and join to form the main sewer outfall for the south side. During illness it is said that all discharges and bedding were properly disinfected.

*Case 107.* Dora Livermore, 1014 McHenry Street. Attending physician, Dr. B. W. Wilson. Age 10. School girl at home during vacation. Taken sick about August 27th; sick four weeks. Drank well water only. Had been in town for at least several months before being taken sick. The house in which patient lived is not connected with either the public water supply or city sewers; it is in rather poor sanitary condition and the surrounding yard was more or less littered with refuse. The well from which drinking water was obtained is dug and probably of shallow depth. It is loosely boarded over and much of the water that is pumped out is returned to the well more or less polluted. The nearest privy is 50 feet distant. The whole neighborhood is in a generally unsanitary and dirty condition. There were no other cases in the immediate neighborhood, though at a distance of several blocks there occurred five cases (Nos. 77, 92, 93, 95 and 142). There has been typhoid in previous years in nearby houses and considerable other sickness during the present year, principally diphtheria.

*Case 108.* Carl Kopp, 569 Holmes Street. Attending physician, Dr. J. K. Hamilton. Age 20. Occupation, driver for grocery wagon of W. J. Neville. Taken sick August 28th; recovered September 24th. Drank both well and city water. Had been in town for at least several months before taking sick. The house in which patient lived was in a neat and clean condition and is well screened during the summer time. It is connected with both the public water supply and the city sewers. Water for drinking purposes was obtained from a neighboring well within about 50 feet of a privy. Water at the store was obtained from a shallow dug well back of Ewers Department Store, among the users of which there

have been several cases of typhoid fever. Patient is said to have drunk but little water about town, though this was obtained from various sources. So far as could be learned, he ate but little raw food that might have carried the typhoid infection. There were no other cases at the home, in the store or among friends or associates, so far as could be learned; neither were there any cases in the immediate neighborhood, though about three blocks removed to the north, there was one case (No. 116). It was said that all discharges and bedding were properly disinfected during illness.

*Case 109.* Mrs. A. A. Taylor, 134 North Garland Avenue. Attending physician, Dr. J. K. Hamilton. Age 53. Occupation, housewife. Taken sick August 29th; recovered September 20th. Drank well water only. Had been in town for at least several months before taking sick. The house was in fairly neat and clean condition, though the yard was somewhat littered with refuse. The house is connected with neither the public water-supply nor the city sewers. Water for drinking purposes was obtained from a neighboring drilled well 85 feet deep and fairly well protected at the top. Privies are 75 feet distant from the well and on the down-hill side, so the drainage from same would probably be away from rather than toward the well. The patient drank considerable buttermilk, but ate very little raw food such as might have carried the typhoid infection. She frequently visited relatives at 584 Loveless Avenue, or just four doors removed from the Sullivan family all the members of which had typhoid fever and six of whom were probably infected through the agency of flies. The surroundings of the home of Mrs. Taylor would not indicate that the infection originated there, and it is quite possible that she was infected during one of the visits to Loveless Avenue. There were no other cases in the family or in the immediate neighborhood. During illness all discharges and beddings were said to have been properly disinfected.

*Case 110.* Mary Metcalf, 24 Arcadia Court. Attending physician, Dr. W. J. Kepple. Age 15. Stayed at home. Taken sick August 29th; still sick at time of investigation. Used well water only. Moved to Youngstown from Ashtabula somewhat over two weeks before being taken sick. The house in which patient lived is not connected with either the public water supply or the city sewers. The sanitary condition of the premises was fair. Water for drinking purposes was obtained from the well at the entrance to Arcadia Court. Analysis of a sample of water from this well indicated it to be influenced by decomposing organic matter, but at the time of sampling it was not in a dangerous condition. Patient was taken from town and no definite information concerning her habits of life, etc., could be obtained. There occurred a number of other cases in this neighborhood. See Case 106 for a description of the locality.

*Case 111.* Frank Elmore, 606 Marshall Street. Attending physician, Dr. J. H. Bennett. Age 33. Occupation, craneman at Bessemer plant of

the Brown-Bonnell Steel Company. Taken sick August 9th; still sick at time of investigation. Used well water only. Had been in town for at least several months before taking sick. The case was complicated with other diseases and patient had not been well or able to work for a year before typhoid set in. The house was in fair sanitary condition. It is not connected with either the public water supply or city sewers. Water for drinking purposes was obtained from a shallow dug well within 40 or 50 feet of privies. Before patient was taken sick with typhoid and while convalescing from previous illness, he attended his brother-in-law, J. W. Waddington (Case 89), on Arcadia Court, who was sick with typhoid. This would amply explain the infection. Milk used by patient was obtained from G. W. Rider's dairy. So far as could be learned, no raw foods were eaten that might have carried the typhoid infection. There were no other cases in the immediate neighborhood. During illness all discharges and bedding were properly disinfected.

*Case 112.* William Hauser, 107 Phelps Street. Treated at city hospital. Age 36. Occupation, driver of ambulance for J. S. Orr & Son. Taken sick August 29th; still sick at time of investigation. Drank both well and city water. Had been in town for at least several months before taking sick. The house in which patient lived and surrounding premises were in fairly clean condition, but the doors and windows are not screened during the summer. Most of the water used for drinking purposes was obtained from a shallow dug well at the corner of Boardman and Phelps streets. Analysis of this water indicates the well to be grossly polluted. In his capacity as driver of an ambulance, the patient had handled a number of typhoid patients when being taken to the city hospital. It is possible that infection may have come from this source, as the man was inexperienced in his work. Patient drank little milk and ate no raw foods, so far as was known, that might have carried the typhoid infection. There were two other cases (Nos. 61 and 63) in the immediate neighborhood, one (No. 63) of which was known to use regularly water from the same well.

*Case 113.* David Gwillim, 116 North Champion Street. Treated at city hospital. Age 43. Occupation, iron worker at the Republic Works of the Brown-Bonnell Steel Company. Taken sick August 29th; still sick at time of investigation. Drank both well and city water, but very little of the latter. Had been in town for at least several months before being taken sick. Lived at a boarding house which was in fairly neat and clean condition and is connected with both the public water supply and the city sewers. Water for drinking purposes at boarding house was obtained from a well at the rear of the house and within 50 or 60 feet of several privies. At the works patient drank well water and may possibly also have drunk more or less raw river water which is pumped about the steel plant for cooling purposes. Ate very little raw foods that might have car-

ried the typhoid infection. There were no other cases of typhoid in this house or in the immediate neighborhood.

*Case 114.* John Broderick, 549 West Lincoln Avenue. Attending physician, Dr. J. A. Sherbondy. Age 6. Stayed at home. Taken sick August 30; convalescent at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The house was fairly clean and neat, but during the summer the windows and doors are only partially screened. The house is not connected with either the public water supply or the city sewers, though both are on the street. Water for drinking purposes was obtained from a dug well loosely boarded over and within 50 feet of about five privies and near two sewers. Milk was obtained from the Rees dairy. The child ate no raw foods that might have carried the typhoid infection. There were no other cases in the same house, but there were twelve cases to the north and east, none of which were more than two blocks away. It was said that all discharges and bedding were properly disinfected during illness.

*Case 115.* Margaret Smith, 34 Arcadia Court. Attending physician, Dr. J. W. Kepple. Age 7. Stayed at home. Taken sick August 31st; still sick at time of investigation. Drank both well water and city water, principally the former. Had been in town for at least several months before being taken sick; had been on premises most of the time, though made occasional visits to other parts of the city. The house is connected with both the public water supply and the city sewers, but well water was used exclusively for drinking purposes, most of the water being obtained from the pump at the entrance of Arcadia Court. The house and premises were in an untidy condition. Milk was obtained from Rider's dairy. No raw foods were eaten, so far as could be learned, that might have carried the typhoid infection. There were a number of other cases in this neighborhood. For a description of the sanitary condition of this locality and probable source of infection see Case 106. It was said that all discharges and bedding were properly disinfected during illness.

*Case 116.* John Rudge, 341 Madison Avenue. Attending physician, Dr. J. J. Thomas. Age two and one-half. Taken sick August 31st; recovered September 23rd. Had been in town for at least several months before taking sick. Drank both city water and well water, principally the former. The house is connected with the public water supply and city sewers and the premises were in most excellent sanitary condition. Windows and doors are well screened in the summer. During the month before being taken sick the child drank well water from a neighboring well which is not within 100 feet of any privy; also drank water from wells at Wick Park and Idora Park. Milk was obtained from Silas Shook. Ate practically no raw foods that might have carried the typhoid infection. There were no other cases in this neighborhood or among playmates of the child; however, early in the year a carpenter (Case 15) who had been working in this neighborhood had been taken sick with



typhoid and in all probability he used some of the privies there. There is nothing further to indicate any connection between the two cases. During illness all discharges and bedding were properly disinfected.

*Case 117.* Paul Gimosky, 564½ Gibson Street. Treated at city hospital. Age 30. Occupation, laborer at the Republic Works of the Brown-Bonnell Steel Company. Taken sick August 31st; convalescent at time of investigation. Drank well water only. Had been in town for at least several months before being taken sick. The neighborhood in which patient lived is in the worst possible sanitary condition. The houses are very dirty and the yards surrounding them are littered with all manner of refuse. None of the houses are screened in summer. Privies are poorly constructed and the well is practically surrounded with them, the nearest being within 30 feet. The well is said to be drilled, but this is doubtful. It is poorly protected at the top. None of the houses in this neighborhood are connected with either the public water supply or city sewers. At the works patient drank well water and may have drunk raw river water which is piped throughout the plant for cooling purposes. Ate practically no raw foods that might have carried the typhoid infection. In spite of the unsanitary condition of the neighborhood in which patient lived, only one other case (No. 124) of typhoid developed during the investigation; but there has been more or less typhoid in this locality during previous years. In connection with this case it should be noted that at the bottom of the hill on which these unsanitary dwellings and privies are located there is a spring used by a large number of persons which can hardly fail to become polluted in time, if not already so, and it is probable that the other case referred to above was infected by water from this spring.

*Case 118.* Murray Byers, 152 McKinnie Street. Attending physician, Dr. J. S. Zimmerman. Age 24. Occupation, workman in cinder pit in Republic Works of the Brown-Bonnell Steel Company. Taken sick August 31st; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The house in which patient lived was in fair sanitary condition, but the windows and doors are not screened during summer. The well from which water was obtained is at the rear of the house and is said to be drilled to a depth of 90 feet. Within 30 feet of it are three privies and a barn. At the works patient drank well water and may possibly have drunk raw river water which is distributed about the plant through pipes for cooling purposes. Milk was obtained from H. Howard's dairy. So far as is known the patient ate no raw foods that might have carried the typhoid infection. There were no other cases in the same house, but there occurred a case (No. 15) in the immediate neighborhood in the early part of the year. There is probably no connection between the two.

*Case 119.* Joseph Farkusokafci. 220 East Boardman Street. Attending physician, Dr. L. B. Smith. Age 22. Occupation, laborer at the Youngstown Sheet Steel and Tube Company. Taken sick September



1st; recovered September 20th; mild case. Drank well water only. Had been in town for at least several months before taking sick. The house was rather dirty and poorly kept and the windows and doors are not screened in summer. The surrounding yards were very much littered with various sorts of refuse. Water for drinking purposes was obtained from a dug well alongside of the house and within 60 feet of several privies which are on the up-hill side. Well water was drunk at the works. So far as could be learned, the patient drank no milk and ate no raw foods that might have carried the typhoid infection. There were no other cases in the same house, though there were two or more in the neighborhood; the two about which information was obtained were Nos. 100 and 129. There were two cases reported for this locality which could not be found.

*Case 120.* Nettie Hoffman. 229 Hughes Street. Age 22. Occupation, domestic at above address. Taken sick about September 1st; still sick at time of investigation. Drank mostly well water, but may have drunk city water also. Had visited Hillsvale, a small town near Youngstown, about two weeks before taking sick, but was feeling badly when she went away. The house in which patient lived was in the very best sanitary condition and is connected with both the public water supply and the city sewers. In the summer windows and doors are well screened. Water for drinking purposes was obtained from a nearby well which is said to be drilled to a considerable depth and is protected at the top by a concrete cover. The nearest privy to the well is about 75 feet distant. Immediately after taking sick she was sent to her home in Lima, Ohio. Her habits were rather irregular and she was about town to a considerable extent in the evenings. Very little could be learned concerning the food she ate or the various ways in which she may have been exposed to infection.

*Case 121.* Thomas Collins. 939 Valley Street. Attending physician, Dr. B. W. Wilson. Age 12. School boy at home during vacation. Taken sick September 2d; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The house is connected with neither the public water supply nor the city sewers. The sanitary condition of the premises was poor and the windows and doors are only partially screened in summer. The yard surrounding the house was littered with various sorts of refuse. Water was obtained from a dug well back of the house, poorly covered at the top, and it is quite likely that considerable refuse water washes into it. Privies are about 50 feet distant from the well and on the down hill side. Patient never drank milk and ate no raw foods, so far as could be learned, that might have carried the typhoid infection. There were no other cases in the same house. Three doors away there were two cases (Nos. 86 and 134) among people who sometimes drank water from the same well, though the well regularly used by them was in much

worse condition than the one described above. This entire neighborhood is in very bad sanitary condition and there were a number of other cases nearby. It is said that all discharges and bedding were properly disinfected during illness.

*Case 122.* Norman W. Beach. 220 River Street. Attending physician, Dr. M. S. Clark. Age 4. Taken sick September 3d; still sick at time of investigation. Drank well water only. Had been in town for at least several months before being taken sick. The house was in poor sanitary condition and is not connected with either the public-water supply or the city sewers. In summer the windows and doors are screened, but the screens are not believed to be very effective. Water for drinking purposes was obtained from a dug well near the house and near several privies. Milk was obtained from Herbert's dairy. The child had eaten no raw foods, so far as was known, that might have carried the typhoid infection. Two years previously there had been two cases in this same house, and during the present year there were a number of cases in the same general locality. For a description of the sanitary condition of the neighborhood and probable cause of infection see Case 106. All discharges and bedding were said to have been properly disinfected during illness.

*Case 123.* Walter Morgan. 622 Thomas Street. Attending physicians, Dr. J. A. Sherbondy and Dr. C. R. Clark. Age 3. Taken sick September 4th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before being taken sick. The house in which patient lived is well screened during the summer time, but it is not connected with either the public water supply or the city sewers. The premises were in a very neat and clean condition. The well from which drinking water was obtained is in the rear of the neighboring house and 50 feet from privies. The child drank no milk and ate no raw foods that might have carried the typhoid infection. He was constantly about the house during the month previous to taking sick. The case was very mild and it was stated by one of the attending physicians that it may not have been typhoid. There were a number of cases of typhoid in this neighborhood, three (Nos. 102, 143 and 153) being within a block.

*Case 124.* John Edmons. 723 Franklin Avenue. Attending physician, Dr. L. B. Smith. Age 14. School boy; attended Polish school near by. Taken sick September 4th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The house in which patient lived is not connected with either the public water supply or the city sewers. The premises were in a rather unsanitary condition; the yard was more or less littered with refuse. Water for drinking purposes was obtained from a spring at the foot of the hill on which was a settlement of most unsanitary dwellings built closely together. For a description of this spring see

Case 117. The boy also drank well water at the school, but had been in school only four days before being taken sick. He occasionally went in bathing in the Mahoning River below the city, but claimed that he had not done so within a month before taking sick. No one else had typhoid fever in the same house or at his school. There was a case (No. 117) on top of the hill below which the spring is located. To the north there were three cases of typhoid that occurred earlier in the season. It was said that all discharges and bedding were properly disinfected during illness.

Case 125. Margaret L. Benner. 1550 Shehy Avenue. Attending physician, Dr. C. M. Klyne. Age 5. Taken sick September 5th; sick for two weeks. Drank well water only. Had been in town for at least several months before taking sick. The house is not connected with either the public water supply or the city sewers. Windows and doors are fairly well screened during summer. The premises were in a neat and clean condition. Milk was obtained from Rider's dairy. The child ate but very little food that might have carried the typhoid infection. Drinking water was obtained from a dug well 40 feet from one privy and 50 feet from another. The well is fairly well protected at the top. The child was at home constantly and never played with other children. There was one other case (No. 149) in this house that occurred eleven days later, indicating the probability of the same source of infection. There were no other cases in the immediate neighborhood, but about a block and a half to the north, on Loveless Avenue, there were seven cases in the house of the Sullivan family that had occurred just previously. These cases are Nos. 62, 69, 71, 72, 73, 74 and 79. About a block to the east of the Sullivan house there occurred one other case (No. 133) shortly afterwards. It was said that all discharges and bedding were properly disinfected during illness.

Case 126. Emmet Rochford. 828 Valley Street. Attending physician, Dr. B. W. Wilson. Age 14. Occupation, employed at Rubber Works to the northwest of the city. Taken sick September 5th; sick for about four weeks. Drank well water only. Had been in town for at least several months before being taken sick. The house in which patient lived is connected with neither the public water supply nor the city sewers, and the doors and windows are not screened during the summer. The premises were in rather unsanitary condition; the yard about the house was more or less littered with refuse. Drinking water was obtained from a shallow dug well (loosely boarded over) at the rear of the house. Within 30 feet of the well is a privy. At the works patient drank spring water. Drank very little milk; such as he did have was obtained from a neighbor who owns a cow. So far as could be learned the patient ate very little raw food that might have caused typhoid fever. There had been several cases of typhoid in the same house in

previous years. There were a number of other cases (Nos. 86, 121, 132 and 134) in this neighborhood, two occurring shortly before and two shortly afterward. One other case was reported but could not be found. It was said that all discharges and bedding were properly disinfected during illness.

*Case 127.* Ernest Holmes. 309 East Myrtle Avenue. Attending physician, Dr. G. L. Pierson. Age 27. Occupation, butcher with Holmes & Robertson, 1306 Market Street. Taken sick September 6th; had been feeling very badly for ten days previous; still sick at time of investigation. Drank both well and city water. Went on an excursion September 2d; otherwise had been in town for at least several months before being taken sick. The house is connected with both the public water supply and the city sewers, and the windows and doors are screened during the summer time. Premises were in very fair sanitary condition. Water for drinking purposes was obtained from a well at 323 Myrtle Avenue. This well is within about 75 feet of a privy. It was stated that in the year previous there were two cases among users of water from this well. There were no other cases in this neighborhood during the present year. At the shop well water was used for drinking purposes, obtained from a well at 1324 Market Street. This well is not in a very good location with reference to privies. Milk was obtained from Stanton Baldwin's dairy. More or less celery and lettuce were eaten, but there is no reason to believe that these constituted the source of infection. It was stated that all discharges and bedding were properly disinfected during illness.

*Case 128.* John Halnan. 323 North Walnut Street. Attending physician, Dr. H. E. Welch. Age 15. School boy on vacation; drove delivery wagon for grocery dealer. Taken sick September 6th; died September 13th. Drank well water so far as is known, but may have drunk some city water while driving delivery wagon. Had been in town for at least several months before taking sick. The house in which patient lived is not connected with either the public water supply or the city sewers, and is only partially screened during the summer. The premises were in an unsanitary condition. The well from which drinking water was obtained is at the rear of the house and within 50 feet of a privy which is on the up-hill side. The well at the store is a deep drilled well about 75 feet from a barn. The water from this well is said to be of good quality and no cases of typhoid fever are known of among its users. There were no other cases in the same house nor in the immediate neighborhood. From one to two blocks to the eastward there were five other cases (Nos. 17, 28, 35, 56 and 151) occurring in a neighborhood which is generally unsanitary. So far as is known the patient ate no raw foods that might have carried the typhoid infection. It was stated that all discharges and bedding were properly disinfected during illness.

*Case 129.* Mrs. Esther Kauffman. 115 South Walnut Street. Attending physician, Dr. M. V. Cunningham. Confined at city hospital.



Age 33. Occupation, housewife. Taken sick September 7th; died about October 1st. Drank both city water and well water. Had been in town for at least several months before taking sick. The house in which patient lived was connected with both the public water supply and the city sewers. There were no screens in the doors or windows. Sanitary condition of premises was very poor; the yard surrounding the house was badly littered with refuse. Water for drinking purposes was generally obtained from a shallow dug well at the corner of Boardman and Walnut streets, and within about 75 feet of several privies. This is the same well that was used by Case 100. Patient drank no milk and ate no raw foods, so far as could be ascertained, that might have carried the typhoid infection. In addition to Case 100 there were two other cases in the neighborhood, No. 119 and one that was reported for this district but which could not be found.

*Case 130.* Mary Davis. Grove Street. Attending physician, Dr. W. R. Howe. Age 4. Taken sick September 7th; convalescent at time of investigation. Drank both well water and city water. Had been in Columbus for nine days just before taking sick. The house is connected with both the public water supply and the city sewers, and the windows and doors are screened in the summer. The premises were in fair sanitary condition. Drinking water was obtained from a well at the rear of the house. This well is dug and fairly well protected at the top, within 60 feet of the privy and on the down-hill side. The child drank city water only occasionally. Milk was obtained from the Clover Leaf dairy. So far as could be learned, no raw food was eaten that might have carried the typhoid infection. While in Columbus the child came in contact with no typhoid fever. In previous years there had been several cases of typhoid in this same house. There were no cases in the immediate neighborhood during the present year, though about a block removed, on Walnut Street, was a case (No. 128) just shortly before.

*Case 131.* Elmer Stocker. 133 Madison Avenue. Attending physician, Dr. M. S. Clark. Confined at city hospital. Age 20. Occupation, delivered milk for J. M. Hayes. Taken sick September 8th; convalescing at time of investigation. Drank well water only. On August 5th went on an excursion to Conneaut Lake; otherwise had been in the city for at least several months before taking sick. The house in which patient lived is connected with both the public water supply and the city sewers. The windows and doors are well screened. The premises and the dairy establishment of J. M. Hayes were in fairly clean condition. The well at the house is drilled and not within 100 feet of any local source of pollution. While driving about on the wagon the patient drank well water in various parts of the city, but always avoided drinking the city water. He drank milk freely, which was bought from various farmers near Youngstown. The patient knew of no cases of typhoid among these farmers. No case of typhoid fever in Youngstown could be traced cer-



tainly to milk from the Hayes dairy. So far as could be learned the patient ate no raw food that might have carried the typhoid infection. There was but one other case (No. 88) in the neighborhood, only a few hundred feet removed, which occurred during the previous month. There is no reason to believe that these cases bear any relation to each other.

*Case 132.* Blanche Crawford. 485 Lansing Avenue. Attending physician, Dr. J. P. Kenny. Age 11. Taken sick September 9th; recovered September 23d. Drank well water only. Had been in town for at least several months before taking sick. The house in which patient lived is connected with neither the public water supply nor the city sewers. The doors and windows are partially screened during the summer time. The sanitary condition of premises was generally poor and the yard was littered with considerable refuse. The well from which drinking water was obtained is said to be drilled, is at the rear of the house and within 50 feet of three privies. The privies are at a slightly lower elevation than the ground about the well, but this can hardly be taken as an indication of the direction of the ground water flow. The patient drank considerable milk which was obtained from the family cow. Ate practically no raw foods which might have carried the typhoid infection. There had been diphtheria in the house and the quarantine was not raised until ten or eleven days before patient was taken sick with typhoid. During quarantine girl remained constantly in the house. There were no other cases in the same house, but there were four other cases (Nos. 86, 121, 126 and 134) in the immediate neighborhood on Valley Street, three of which occurred shortly before and one a short time after. It would appear probable that infection was carried in this instance by flies.

*Case 133.* Lizzie Adunka. Corner Oak Street and North Jackson Avenue. Treated at city hospital. Age. 20. Occupation, housewife. Taken sick September 9th; still sick at time of investigation. Drank well water only. Had been in town for several months before taking sick. The house in which patient lived is connected with neither the public water supply nor the city sewers, and the windows and doors are not screened in summer. The premises are in a rather unsanitary condition, and would probably be much worse except for the newness of the house. The well from which the drinking water was obtained is at the rear of the house and is protected at the top by a concrete cover. Within 25 to 30 feet is a privy, well constructed. On account of the newness of the privy it is probable that the well has not yet been influenced thereby. The patient drank little milk and so far as could be learned ate no raw food that might have carried the typhoid infection. There were no other cases in the house, but within about 800 feet there occurred seven cases (Nos. 62, 69, 71, 72, 73, 74 and 79) in one family, and it is quite likely that this case is one of fly infection.

*Case 134.* Mrs. Anna Kelley. 923 Valley Street. Attending physician, Dr. M. V. Cunningham. Confined at city hospital. Age 26.

Occupation, housewife. Taken sick September 10th; still sick at time of investigation. The house is neither connected with the public water supply nor the city sewers, and the windows and doors are not screened in summer. The sanitary condition of the premises was bad. Water for drinking purposes was obtained from two wells, both of which are located near privies; the one nearest the house was analyzed and found to be grossly polluted; the other is probably a little better. Milk was obtained from Higgins's dairy. Patient had eaten no raw foods, so far as could be learned, that might have carried the typhoid infection. The patient's son was taken sick in the early part of August and was attended during part of his illness by the mother. A number of other cases (Nos. 121, 126, 132 and 134) occurred in the immediate neighborhood.

*Case 135.* Tim Scanlon. 1124 Poland Avenue. Attending physician, Dr. B. B. McElhany. Age 11. School boy at home during vacation. Taken sick September 10th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The house is connected with neither the public water supply nor the city sewers, and the doors and windows are not screened in summer. The well from which much of the drinking water was obtained is on low ground adjacent to the river and 50 feet from a privy. Gibson spring water was also used for drinking purposes. The sanitary condition of the premises was rather poor. The boy frequently went in bathing in the Mahoning River below the city. There were no cases among the boy's playmates or in the same house, nor were there any other cases in this neighborhood. The boy was probably infected from going in bathing in the Mahoning River below the sewer outlets. It was said that all discharges and bedding were properly disinfected during illness.

*Case 136.* Archibald Lamb. Hotel Wilson on Himrod Avenue. Attending physician, Dr. C. M. Klyne. Confined at city hospital. Age 27. Occupation, brick layer at the Ohio Steel Plant of the Carnegie Steel Company. Taken sick about September 12th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The hotel is connected with both the public water supply and the city sewers. The windows and doors are screened during the summer. Sanitary condition of premises was fair. Water was obtained from a spring in the cellar, which is open at the top and is protected by means of a 24-inch tile pipe. The spring is several feet deep and flows a constant stream. Milk was obtained from the Beard Creamery Company. So far as could be learned the patient had eaten no raw foods that might have carried the typhoid infection. He drank considerable water at the works, but these wells were chemically examined and found to be in good condition. There was one other case (No. 101) in this hotel which occurred during the previous month.

*Case 137.* Joe Melargus. 396 East Wood Street. Attending phy-

sician, Dr. J. B. Kotheimer. Confined at city hospital. Age 18. Occupation, section hand on B & O Railroad; worked in Hazelton just east of Youngstown. Taken sick September 12th; convalescent at time of investigation. Drank both well and city water. Drank some milk. The house in which patient lived was connected with neither the public water supply nor the city sewers. Water was obtained from a shallow dug well in the neighborhood of privies. The patient also drank from numerous other wells about town. There were no other cases in the immediate neighborhood nor among section hands on the same gang with patient. On account of the patient's inability to speak English, it was impossible to get detailed information.

*Case 138.* John Nutter. 715 Andrews Avenue. Attending physician, Dr. R. H. Barnes. Age 10. School boy attending Wood Street school. Taken sick September 12th; still sick at time of investigation. Drank well water only. The house in which patient lived is not connected with either the public water supply or the city sewers. The windows and doors are screened in summer. Sanitary condition of premises was fairly good. Water for drinking purposes was obtained from a dug well at the front of the house and within about 100 feet of a privy. The ground on which the house is located is low and is adjacent to Crab Creek. The soil is gravelly and porous, and this neighborhood is subject to floods during high water in the creek. During the summer the boy went in bathing in Crab Creek near the house, sometimes as often as three times a day. Above this point several sewers, public as well as private, enter the stream. There had been several cases of typhoid fever in the same house a number of years previously. During the present year there were no cases in the immediate neighborhood, though it was said at the time of examination that a person sick nearby was probably developing typhoid. No definite information in regard to this case was obtained before the investigation ended.

*Case 139.* Fred Kendall. 913 West Federal Street. Attending physician, Dr. C. M. Klyne. Age 14. Occupation, employed at Douglas's grocery store at the corner of Thomas and Griffith streets. Taken sick September 12th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before being taken sick. The house is not connected with either the public water supply or the city sewers, and the doors and windows are but partially screened during the summer time. The condition of the premises was only fair. Water for drinking purposes was obtained from a dug well 20 feet deep, located at the rear of the house and within about 40 feet of a privy. The privy is on the down stream side and presumably the drainage is away from the well. Patient drank well water in various parts of the city. He drank no milk and ate no raw foods, so far as could be learned, that might have carried the typhoid infection. There was one other case (No. 39) in the same house which occurred in the early part

of the year, viz: April 9th. There is probably no relation between these two cases. It was claimed that all discharges and bedding were properly disinfected.

*Case 140.* Mrs. John Henry. 211 Penn Avenue. Attending physician, Dr. Whelan. Age 25. Occupation, housewife. Taken sick September 12th; still sick at time of investigation. Drank well water only. The patient had been in Toledo for one week just before taking sick; otherwise, had been in town for several months previous to the illness. The house is connected with neither the public water supply nor the city sewers. Windows and doors are screened in summer. The water used for drinking purposes was obtained from a shallow dug well at the rear of the house. The patient drank no milk and so far as was known, ate no raw food that might have carried the typhoid infection. A brother of Mrs. Henry had been taken sick out of town and brought to Youngstown a short time before and was nursed by her. It is quite likely that the fever may have been taken in this way. Another brother (Case 152) of patient was taken sick with typhoid a short time later. There were in the neighborhood two other cases (Nos. 59 and 141), but these probably have no connection with this one. It was said that all discharges and bedding were properly disinfected during illness.

*Case 141.* Sankey Ripple. Corner Stafford Street and Penn Avenue. Attending physician, Dr. R. H. Barnes. Age 30. Occupation, iron worker at the Republic Works of the Brown-Bonnell Steel Company. Taken sick September 13th; still sick at time of investigation. Had been away from town the 1st, 2nd and 3rd of September; otherwise, had been in town for several months before taking sick. The house is not connected with the public water supply or the city sewers, and the doors and windows are not screened during the summer time. Sanitary condition of premises was only fair. Water for drinking purposes was obtained from a shallow dug well within 25 feet of a privy. At the works patient drank well water and may probably have drunk raw river water which is distributed through pipes about the plant for cooling purposes. Patient drank very little milk; such as he did have was obtained from Kerns' dairy. Ate no raw foods, so far as was known, that might have carried the typhoid infection. There were no other cases in the house or among fellow workers at the plant. There occurred two cases (Nos. 140 and 152) and one other, an important case, about a block distant on the opposite side of the same street. It was said that all discharges and bedding were properly disinfected during illness.

*Case 142.* Mrs. Margaret Billy. 1002 State Street. Treated at city hospital. Age 22. Occupation, housewife and domestic. Taken sick September 3rd; still sick at time of investigation. Drank well water only. Had been in town for at least several months before being taken sick. The house in which patient lived is not connected with either the public water supply or the city sewers. The windows and doors are not



screened in summer. The well from which drinking water was obtained is a shallow dug well loosely boarded over and 50 feet from a privy. The general sanitary condition of the premises was bad. There had been cases of typhoid fever in the house during previous years but none during the present one. The patient had done some washing for Case 77 on Albert Street. Drank no milk; ate more or less lettuce which was obtained from a neighbor's garden; otherwise, had eaten no raw foods that might have carried the typhoid infection. There were two other cases (Nos. 92 and 93) that occurred sometime before about a half block away, but these probably bore no relation to the case here described.

*Case 143.* Mrs. William Law. 544 Foster Street. Attending physician, Dr. C. Allen Cross. Confined at city hospital. Age 43. Occupation, housewife. Taken sick September 13th; died September 23rd. Used well water only. Had been in town for at least several months before being taken sick. The house is not connected with either the public water supply or city sewers. The windows and doors are partially screened in summer. Sanitary conditions of premises was only fair. The well from which drinking water was obtained is at the rear of the house and within 60 feet of a privy. The daughter of patient was taken sick (See Case 102) August 18th and was attended by her mother until the latter was taken ill. Infection was most likely obtained during attendance on daughter. There were numerous other cases (Nos. 22, 33, 48, 60, 90, 80, 82, 114, 123 and 153) in this neighborhood, lying principally to the east and south. It was said that during illness all discharges and bedding were properly disinfected.

*Case 144.* Ellen Hand. 1132 Hezler Street. Attending physician, Dr. H. E. Blott. Age 5. Taken sick September 14th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The house is neither connected with the public water supply nor the city sewers. The windows and doors are not screened during the summer. Premises were in rather an untidy and unsanitary condition. Water for drinking purposes was obtained from a well in front of the neighboring house in which there had been a typhoid fever case (No. 91) shortly before, which see for description of well. Eight year old sister of patient was taken sick on the same day. These children did not come in contact with the typhoid case next door, but played with children living in that house. The quality of the water used is sufficient to explain infection, but it may have been carried by flies also. Milk was obtained from a cow owned by a neighboring family, and the same as furnished milk in Case 91. Child ate no raw food, so far as was known, that might have carried the typhoid infection. Other than these three cases, there were none in the neighborhood. It was said that all discharges and bedding were properly disinfected during illness.

*Case 145.* Mary Hand. 1132 Hezler Street. Attending physician, Dr. H. E. Blott. Age 8. Attended Caldwell school. Taken sick



September 14th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. For description of premises and possible source of infection and other general information see Case 144.

*Case 146.* H. L. Yerian. 216 Hughes Street. Attending physician, Dr. M. V. Cunningham. Age 35. Occupation, proprietor of moving van business. Drank both city and well water. Had been to Middleton on Sundays one, three and four weeks previous to being taken sick; otherwise, had been in town for at least several months before illness. The house in which patient lived is connected with both the public water supply and city sewers. In summer windows and doors are screened. The house was in very good sanitary condition and the premises were neat and clean; however, in neighboring yards there were several refuse piles. The patient usually drank city water at home, but frequently drank water from a shallow dug well on Ellis Street near his barn. This well is located in the vicinity of several privies. Drank no milk and ate no raw foods, so far as could be learned, that might have carried the typhoid infection. There were no other cases in the same house; however, there had been three cases (Nos. 20, 99 and 120) on the same street and in the immediate neighborhood. It was said that all discharges and bedding were properly disinfected during illness.

*Case 147.* Joe Strabob. 1101 Central Avenue. Treated at Mahoning Valley Hospital. Age 30. Occupation, iron worker at the upper Carnegie Steel Plant. Taken sick September 16th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before being taken sick. The house in which patient lived is connected with neither the public water supply nor city sewers. During summer windows and doors are not screened. The sanitary condition of the premises as well as of the surrounding neighborhood is exceedingly bad. Water for drinking purposes was obtained from a shallow dug well poorly protected at the top and within 30 feet of several privies. Sink drainage was allowed to run across the ground and much of it was standing in stagnant pools. The patient drank no milk and ate no raw foods, so far as could be learned, that might have carried the typhoid infection. No one else in the house was sick previously and no one in the immediate neighborhood, though one block removed there occurred a case (No. 21) considerably earlier in the year. Two blocks away there occurred three cases (Nos. 91, 144 and 145).

*Case 148.* Arthur B. Weaver. 124 East Chalmers Avenue. Attending physician, Dr. W. W. Ryall. Age 22. Occupation, pattern maker at the Youngstown Sheet Steel & Tube Company. Taken sick September 16th; still sick at time of investigation. Mild case. Drank both well and city water, principally the former. The house in which patient lived is connected with neither the public water supply nor the city sewers. Sanitary condition of premises was good. The well from

which drinking water was obtained is in the neighborhood of a privy. At the works patient is said to have drunk Mahoning River water which is piped throughout the plant for cooling purposes. There were no other cases in the house or neighborhood. It was stated that all discharges and bedding were properly disinfected during illness.

*Case 149.* William Benner. 1550 Shehy Avenue. Attending physician, Dr. William H. Taylor. Confined at Mahoning Valley Hospital. Age 30. Occupation, employed at Youngstown Steel Roofing Company. Taken sick September 16th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. For sanitary condition of premises and probable source of infection see Case 125. The small sister of patient was sick with typhoid fever a short time before. There were no other cases in the immediate neighborhood except those referred to under Case 125.

*Case 150.* John Speck. Coxilbert and Emma streets. Attending physician, Dr. J. J. Thomas. Age 23. Occupation, worked on dinkey engine in the valley mills of the Brown-Bonnell Steel Company. Taken sick September 19th; still sick at time of investigation. Drank well water only. Had been in town for at least several months before taking sick. The house is connected with neither the public water supply nor the city sewers. Windows and doors are not screened in summer. Sanitary condition of premises was good. The well from which drinking water was obtained is a shallow dug well located within 25 feet of a privy. The milk used was supplied by a neighbor's cow. The patient ate no raw foods, so far as could be learned, that might have carried the typhoid infection. There were no other cases in the same house, though there had been another case (No. 13) in this neighborhood in the earlier part of the year. It was said that all discharges and bedding were properly disinfected during illness.

*Case 151.* Maggie Mitchell. 327 Meadow Street. Attending physician, Dr. C. D. Hauser. Confined at city hospital. Age 26. Occupation, domestic at 725 Wick Avenue. Taken sick September 20th; still sick at time of investigation. Drank both city and well water. About the first of September had been to Cambridge Springs for several days; otherwise, had been in town for several months before illness. Stayed at place of employment most of time, but visited at home on Thursdays and Sundays. The house where patient served as domestic is connected with both the public water supply and city sewers, is on high ground and in very good sanitary condition. At this house well water was generally used for drinking purposes, though city water was occasionally drunk by the patient. The home of patient is not connected with either the public water supply or the city sewers. Windows and doors are screened, but the premises were in a rather unsanitary condition. Water for drinking purposes was obtained from a shallow dug well

within 40 feet of several privies which were on the down-hill side and probably subsurface drainage from them is away rather than toward the well. The whole neighborhood is in a bad sanitary condition and there are numerous poorly constructed privies. Immediately across the street there had occurred another case (No. 56) in the early part of the summer. There also occurred four cases (Nos. 17, 28, 35 and 56) within a distance of several blocks.

*Case 152.* John Scannel. 211 Penn Avenue. Attending physician, Dr. Whelan. Age 19. Occupation, stove maker. Taken sick September 23rd; still sick at time of investigation. Drank well water only. Had been in Rochester, Pennsylvania, a short time immediately before taking sick. Infection must have obtained in Youngstown. Attended sister during illness with same disease shortly before. For detailed description of premises and probable source of infection see Case 140. There were two other cases in same house, one of which was infected outside of Youngstown. Two other cases (Nos. 59 and 141) occurred in the near neighborhood. It was said that during illness all discharges and bedding were properly disinfected.

*Case 153.* Alvin Williams. 714 Thomas Street. Attending physician, Dr. F. H. Simpson. Age 20. Occupation, collector in produce and commission business. Taken sick September 24th; still sick at time of investigation. Drank well water only. Went to Sharon every Wednesday for a portion of the day; otherwise, had been in town for several months before illness. The house in which patient lived is not connected with either the public water supply or city sewers. Windows and doors are but partially screened in summer. Premises were in fair sanitary condition. Water at the house was obtained from a drilled well said to be 100 feet deep and cased all the way down. Within 60 feet of the well and on the up-hill side is a privy. Patient drank more or less milk obtained from Wehr's dairy; also ate raw vegetables, but obtained them from a particular farmer near Youngstown in whose family there had been no typhoid fever. There were no other cases in the same house, but there occurred a large number of cases (Nos. 22, 33, 48, 60, 80, 82, 90, 102, 114, 123 and 143) within several blocks to the eastward. It was said that all discharges and bedding were properly disinfected during illness.

## APPENDIX II.

## LIST OF CASES INSPECTED OUTSIDE OF YOUNGSTOWN AND CASES BROUGHT TO YOUNGSTOWN FOR TREATMENT.

The following cases were infected outside of Youngstown. The first fifteen cases, excepting two which may have been infected by personal contact with another member of the same family who was infected outside of Youngstown, are those having residence in Youngstown but which had been out of town until such a short time before taking sick that it is reasonable to suppose the infection was contracted while away. The last twenty cases were all brought to Youngstown in a sick condition for treatment at either the Youngstown city hospital or the Mahoning Valley Hospital. Of the cases enumerated, nineteen were treated at the former hospital and five were treated at the latter. Out of the entire number five died.

*Case 1.* Lucille Beck. 1023 Ford Avenue. Attending physician, Dr. H. E. Welch. Age  $2\frac{1}{2}$ . Taken sick December 14, 1905; ill about three weeks. Had been in Toledo until within a week before taking sick. At Toledo drank well water which is supposed to have been polluted.

*Case 2.* Harry Dick. 323 East Myrtle Avenue. Attending physician, Dr. Montgomery. Age 28. Occupation, machinist at South Sharon. Taken sick March 31st; recovered about middle of May. Was taken sick in Sharon where he had spent several weeks and was brought to Youngstown for treatment.

*Case 3.* Robert Quinn. 138 Byron Street. Attending physician, Dr. G. J. Smith of Niles. Age 35. Occupation, iron worker at steel plant in Niles. Taken sick July 11th; died August 1st. Had lived in Niles regularly for at least a month before taking sick, although he made occasional visits to Youngstown. It is very probable that the infection was taken in Niles.

*Case 4.* Ostie Beck. 1023 Ford Street. Attending physician, Dr. H. E. Welch. Age 9. School girl. Taken sick January 15th; ill about three weeks. Had visited in Toledo about four weeks previous to illness with small sister, where latter contracted typhoid. Infection was probably taken from small sister whom patient attended during illness. It might be stated that both cases in this family used well water only in Youngstown.

*Case 5.* Albert Howell. 733 Hayman Street. Attending physician, Dr. Schaffer. Confined at city hospital. Age 22. Occupation, machinist. Admitted at hospital July 23rd; dismissed August 15th. Lived in DeNora, Pa., and was brought to Youngstown for treatment.

*Case 6.* Mrs. Margaret Townsend. 528 Bryson Street. Attending physician, Dr. J. A. Sherbondy. Age 23. Occupation, housewife. Taken sick July 19th; sick about six weeks. Had been in Pittsburgh for three



weeks and returned to Youngstown just about two weeks before taking sick. It is believed that infection was obtained in Pittsburgh. While in Youngstown well water only was used for drinking purposes. Baby child of patient was taken sick with typhoid fever about September 2nd. There were typhoid fever cases in the house in which patient visited while at Pittsburgh.

*Case 7.* Winnie Cassidy. 1028 Poland Avenue. Attending physician, Dr. Mackleheny. Confined at city hospital. Age 21. Occupation, domestic in Struthers. Admitted at hospital July 27th; discharged September 15th. Taken sick in Struthers and brought to Youngstown for treatment.

*Case 8.* William Scannel. 211 Penn Avenue. Attending physician, Dr. Whelan. Confined at city hospital. Age 21. Occupation, fireman on railroad. Admitted at hospital August 17th; discharged September 15th. Previous to time that patient was taken sick he had been for five weeks in Pittsburgh and was brought to Youngstown for treatment. It should be noted in connection with this case that Cases Nos. 140 and 152 (see Appendix I) were infected from it.

*Case 9.* Mrs. John Stewart. 325 Fairview Avenue. Attending physician, Dr. D. W. Baker. Taken sick August 22nd; recovered September 15th. Had been out of town until a few days before illness. Patient's husband, who had been with her while out of town, was taken sick three days later.

*Case 10.* John Stewart. 325 Fairview Avenue. Attending physician, Dr. D. W. Baker. Taken sick August 25th; recovered September 15th. Had been out of town for a considerable length of time and until a few days before taking sick. Wife of patient, who was with him while away from Youngstown, was taken sick three days previously.

*Case 11.* Frank Krohn. 229 Superior Street. Attending physician, Dr. Baker. Age 19. Occupation, employed at Niles in tin works. Taken sick September 4th; still sick at time of investigation. Had been in Niles for several months before being taken sick and was brought to Youngstown for treatment.

*Case 12.* Isabell Liebman. 285 Wick Avenue. Taken sick September 9th, immediately on returning from Cambridge Springs, where she had been for some length of time.

*Case 13.* Harry Townsend. 528 Bryson Street. Attending physician, Dr. J. A. Sherbondy. Taken sick September 16th. Had been in Pittsburgh for sometime and returned to Youngstown less than two weeks before taking sick. Mother of patient taken sick with typhoid about four weeks previously. (See Case 6.)

*Case 14.* Philip Harvey. 517 Elm Street. Confined at city hospital. Age 14. School boy. Taken sick September 14th. Had been in Raymond, Ohio, all summer and was taken sick immediately upon return.



*Case 15.* John Finnerty. 467 Rice Avenue. Attending physician, Dr. Cunningham. Age 27. Occupation, night superintendent at works in Wheatland, Pa. Taken sick September 24th; still sick at time of investigation. Patient was away at work during week; came home to spend Sunday. At home drank well water only. It is believed that infection was obtained at Wheatland, since a number of others at that place were taken ill with typhoid fever at the same time.

The following list of cases is of persons who were brought to Youngstown for treatment in either the city or Mahoning Valley hospitals. None of the cases enumerated has a residence in Youngstown.

*Case 16.* Daniel McClaren. Struthers. Confined at Mahoning Valley Hospital. Age 22. Occupation, sheet mill worker. Taken sick January 12th; died February 16th.

*Case 17.* Thomas G. Strock. Niles. Confined at city hospital. Age 19. Occupation, bookkeeper. Admitted at hospital March 7th; discharged May 6th.

*Case 18.* Frank Dalton. Boardman, Ohio. Confined at city hospital. Age 21. Occupation, millman. Admitted March 14th; discharged April 5th.

*Case 19.* David Mantane. Warren. Confined at city hospital. Age 25. Occupation, draftsman. Admitted March 10th; died March 31st.

*Case 20.* Elmer Oatstene. Steelton, Ohio. Confined at city hospital. Age 36. Occupation, farmer. Admitted March 30th; discharged May 19th.

*Case 21.* Albert Humphries. Sharon, Pa. Confined at city hospital. Age 21. Occupation, advertising manager. Admitted April 1st; discharged May 25th.

*Case 22.* James Norman. Cleveland. Confined at Mahoning Valley Hospital. Age 34. Colored. Admitted February 15th; discharged April 4th.

*Case 23.* John Sullivan. Hubbard, Ohio. Confined at Mahoning Valley Hospital. Age 26. Admitted April 10th; discharged May 14th.

*Case 24.* George G. Herter. Detroit, Mich. Confined at Mahoning Valley Hospital. Admitted April 19th; discharged May 4th.

*Case 25.* Samuel Luper. Niles. Confined at city hospital. Age 25. Occupation, laborer. Admitted June 3rd; discharged August 5th.

*Case 26.* Andy Karaffa. Girard. Confined at city hospital. Age 34. Occupation, laborer. Admitted June 29th; discharged August 6th.

*Case 27.* Andrew Yavok. East Youngstown, outside of city limits. Confined at city hospital. Age 24. Occupation, laborer. Admitted July 9th; discharged August 21st.

*Case 28.* John Fusco. Girard. Confined at city hospital. Age 37. Occupation, laborer. Admitted July 14th; discharged September 4th.

*Case 29.* Mrs Elizabeth Chapman. Flint Hill. Confined at city hospital. Age 51. Occupation, housewife. Admitted August 9th.

*Case 30.* James Weir. Mahoning Avenue extension, outside of city limits. Confined at city hospital. Age 24. Occupation, brakeman. Admitted August 23rd; discharged September 14th.

*Case 31.* Gus Neworth. Calla, Ohio. Confined at city hospital. Age 26. Occupation, laborer. Admitted August 24th; died September 9th.

*Case 32.* Thomas Pilecci. Hillsvale, Pa. Confined at Mahoning Valley Hospital. Admitted September 10th; died September 15th.

*Case 33.* John Reno. Warren. Confined at city hospital. Admitted September 14th; still sick at time of investigation.

*Case 34.* Walter Poole. 138 Marion Avenue. Had been out of town until taken sick. Confined at city hospital. Age 28. Admitted September 15th; still sick at time of investigation.

*Case 35.* Philip Reed. Hazelton car barns. Confined at city hospital. Age 29. Occupation, motorman. Admitted September 18th; still sick at time of investigation.

*Case 36.* Elmer Fisher. Akron. Confined at city hospital. Age 21. Occupation, orderly. Admitted September 20th; still sick at time of investigation.

## APPENDIX III.

## REPORT OF CHEMICAL AND BACTERIAL ANALYSIS.

During the investigation twenty-three samples were collected from various wells about Youngstown and submitted to chemical and bacterial analyses. All chemical samples were shipped by express on date of collection to the laboratories of the State Board of Health, and the analyses were begun immediately on receipt. All of the bacterial samples were taken to the laboratory of the filtration plant and plated on day of collection. Each sample was plated in  $1/10$  and  $\frac{1}{2}$  cubic centimeter portions on agar and incubated for two days at room temperature. The culture media and plates for the first fifteen samples were obtained from the laboratories of the State Board of Health. For the other samples plates and culture media were kindly furnished by the superintendent of the filter plant. Tubes of dextrose broth were all furnished by the superintendent of the plant. These were inoculated with one cubic centimeter portions of all the samples and the formation of gas noted after forty-eight hours. Most of the bacterial samples after having portions plated and inoculated into the dextrose tubes were sent to the State Board of Health laboratories for the confirmative test for colon bacillus. Owing to the time that elapsed between the collection of samples and the time they were analyzed for the colon bacillus it is quite likely that in some cases at least this bacterium had been exterminated and, therefore, the colon results can scarcely be taken as conclusive. Such is especially the case in view of the fact that some of the colon determinations were made with one cubic centimeter of the sample only, the larger portion of the one hundred cubic centimeters having been unavoidably lost. In the light of the above it is believed that some weight should be given to the formation of gas in the dextrose tubes though it is recognized that this is not a reliable test for injurious pollution. But taken in connection with the physical examination, the chemical analysis and the bacterial count it will at least be significant.

The appended table of analyses gives the results obtained from the twenty-three samples analyzed. It will be noted that only such constituents are recorded as will throw light on the sanitary qualities of the water. In six of the samples only bacterial determinations were made. Following the table of analyses is given a discussion of each sample. These discussions are compiled from notes taken in the field and from the reports of the chemist and bacteriologist of the Board.

## ANALYSIS OF SAMPLES OF WATER FROM YOUNGSTOWN.

COLLECTED OCTOBER 10TH AND 11TH, 1906.

PARTS PER MILLION.

*Private Wells.*

Source of sample.....	Dug Well on Hezler St.	Dug Well on Thom- as St.	Dug Well Cor.Board- man and Phelps Sts.	Dug Well on Valley St.
Number of sample.....	1	2	3	4
Laboratory number .....	5918	5926	5928	5931
Turbidity .....	none	.....	.....	.....
Sediment .....	none	.....	.....	.....
Odor .....	none	.....	.....	.....
Oxygen required .....	1.00	2.45	2.58	1.28
N. { Ammonia albuminoid ..	.066	.044	.200	.280
as { Ammonia free .....	none	.006	.004	.008
{ Nitrites .....	trace	trace	.002	.006
{ Nitrates .....	10.0	10.0	16.0	28.0
Chlorine .....	59.2	44.0	64.4	96.2
Bacteria per c.c.....	850	825	1000	350
Gas in Smith Tube.....	yes	yes	yes	yes
Colon bacillus .....	not in 1cc.	not in 100cc.	not in 1cc.	yes in 100cc.

SAMPLES COLLECTED OCTOBER 11TH, 1906.

PARTS PER MILLION.

*Private Wells.*

Source of sample.....	Drilled Well on Arcadia Court.	Dug Well on River St.	Shallow Dug Well on Edwards St.
Number of sample.....	5	6	7
Laboratory number .....	5932	5933	5934
Turbidity .....	.....	.....	.....
Sediment .....	.....	.....	.....
Odor .....	.....	.....	.....
Oxygen required .....	1.05	2.40	1.52
N. { Ammonia albuminoid .....	.216	.116	.248
as. { Ammonia free .....	trace	.138	.104
{ Nitrites .....	none	.020	.004
{ Nitrates .....	10.0	18.0	8.0
Chlorine .....	28.8	108.6	13.6
Bacteria per c.c.....	2000	2760	2500
Gas in Smith Tube.....	yes	yes	yes
Colon bacillus .....	not in 100cc.	yes in 100cc.	.....

SAMPLES COLLECTED OCT. 11TH AND 12TH, NOV. 2ND AND OCT. 29TH, 1906.

PARTS PER MILLION.

*Public Wells.*

Source of sample.....	Dug Well at Rayen Av. School.	Wheeler Spring at Spring.	Drilled Well in Public Square.	Drilled Well at St. Columba's School.
Number of sample.....	8	9	10	11
Laboratory number .....	5929	5937	6113	6107
Turbidity .....	.....	.....	none	40.
Sediment .....	.....	.....	none	slight
Odor .....	.....	.....	none	earthy
Oxygen required.....	.47	1.16	.86	.54
N. { Ammonia albuminoid ...	.032	.164	.002	.106
as { Ammonia free .....	trace	.082	trace	.068
{ Nitrites .....	trace	trace	.002	none
{ Nitrates .....	4.0	none	6.0	none
Chlorine .....	12.6	28.4	51.2	24.6
Bacteria per c.c.....	430	65	775	250
Gas in Smith Tube.....	yes	no	yes	.....
Colon bacillus .....	not in 100cc.	not in 1cc.	yes in 50 cc.	not in 100cc.

SAMPLES COLLECTED OCTOBER 9TH AND 10TH, 1906.

PARTS PER MILLION.

*Industrial Plant Wells.*

Source of sample.....	Drilled Well at Office of Ohio Wks.	Drilled Well in Yard of Ohio Wks.	Drilled Well on Hill near Ohio Works.	Drilled Well at Lower Carnegie Mills.
Number of sample.....	12	13	14	15
Laboratory number .....	.....	5919	.....	5925
Turbidity .....	.....	trace	.....	.....
Sediment .....	.....	trace	.....	.....
Odor .....	.....	none	.....	.....
Oxygen required.....	.....	.76	.....	1.82
N. { Ammonia albuminoid ...	.....	.024	.....	.060
as { Ammonia free .....	.....	.030	.....	.282
{ Nitrites .....	.....	none	.....	trace
{ Nitrates .....	.....	trace	.....	none
Chlorine .....	.....	2.8	.....	101.6
Bacteria per c.c.....	27	50	1280	25
Gas in Smith Tube.....	no	no	yes	no
Colon bacillus .....	.....	not in 100cc.	.....	not in 100cc.



## SAMPLES COLLECTED OCTOBER 10TH, 1906.

PARTS PER MILLION.

*Industrial Plant Wells.*

Source of sample.....	Dug Well at Lloyd,Bo'th Works.	Drilled Well No. 1 at Re p u b l i c Works.	Drilled Well No. 2 at Re p u b l i c Works.	Drilled Well No. 3 at Re p u b l i c Works.
Number of sample.....	16	17	18	19
Laboratory number .....	.....	5927	.....	.....
Turbidity .....	.....	.....	.....	.....
Sediment .....	.....	.....	.....	.....
Odor .....	.....	.....	.....	.....
Oxygen required.....	.....	.....	.....	.....
N. { Ammonia albuminoid .....	.....	.....	.....	.....
as { Ammonia free .....	.....	.....	.....	.....
{ Nitrites .....	.....	trace	.....	.....
{ Nitrates .....	.....	4.0	.....	.....
Chlorine .....	.....	11.4	.....	.....
Bacteria per c.c.....	1220	41	630	485
Gas in Smith Tube.....	yes	no	yes	yes
Colon bacillus .....	.....	not in 100cc.	.....	.....

## SAMPLES COLLECTED OCTOBER 11TH AND 12TH, 1906.

PARTS PER MILLION.

*Industrial Plant Wells.*

Source of sample.....	S p r i n g on Monroe St.	Dug Well at Upper Val- ley Mills.	Dug .Well No. 1, Y. S. S. & T. Co.	Dug Well No. '2, Y. S. S. & T. Co.
Number of sample.....	20	21	22	23
Laboratory number .....	5930	.....	5935	5936
Turbidity .....	.....	.....	.....	.....
Sediment .....	.....	.....	.....	.....
Odor .....	.....	.....	.....	.....
Oxygen required.....	.48	.....	.10	2.74
N. { Ammonia albuminoid .....	.030	.....	.024	.134
as { Ammonia free .....	.006	.....	.004	.096
{ Nitrites .....	.010	.....	none	.008
{ Nitrates .....	12.0	.....	3.0	4.0
Chlorine .....	47.8	.....	34.0	9.0
Bacteria per c.c.....	490	80	65	1500
Gas in Smith Tube.....	no	yes	no	yes
Colon bacillus .....	not in 1cc.	.....	not in 1cc.	.....

## DISCUSSION OF ANALYSIS.

*Private Wells.*

*Sample No. 1.* Laboratory No. 5918. From dug well at 1136 Hezler Street. As nearly as could be learned this well is about 30 feet deep and is walled up by loose rubble. The top is protected by well made wooden platform, but the crevices between the planks are of sufficient size to admit accidental pollution. A good wooden pump is used to draw

water. The samples were taken from the pump after three or four minutes pumping. It appears that the water is derived from sand and gravel that constitutes a portion of the river drift at this point. The house is about 30 feet from the well and several poorly constructed privies are from 60 to 75 feet on the uphill side, the slope of the hill being rather gentle at this point. The premises about the well are generally unsanitary, the ground is more or less littered with refuse and sink drainage is permitted to flow near the well. It is believed also that washing of clothes is occasionally done over the well. On August 13th, one of the occupants of the house near the well was taken sick with typhoid (Case 91, Appendix I), the infection being most likely obtained elsewhere. The fever lasted until about September 22nd and the patient was convalescent at time of investigation. On September 14th two children in the next door house were taken sick with typhoid (Cases 144 and 145, Appendix I). These children drank freely of the well water and occasionally played with the children in the house where case 91, Appendix I, was confined.

Turning to the analyses, the presence of a trace of nitrites, the high nitrates and chlorine, the considerable number of bacteria and typical gas production for the colon bacillus in the dextrose tube all indicate the presence of injurious pollution. The comparative low ammonias and oxygen required would indicate that partial purification had taken place at time of sampling. This purification may be due to passage of the water through the ground or to its storage in the well. In other words the evidence of pollution may be due to the influence of neighboring privies or it may be due to accidental pollution entering the top. In either case the wells indicated by the analysis as well as the strong probability of its being the source of infection of cases 144 and 145, Appendix I, to be dangerously polluted. Furthermore, the tendency in this well is for the pollution to become greater and greater.

*Sample No.: 2.* Laboratory No. 5926. From well at 426 Thomas Street. This is a dug well about 25 feet deep and lined probably with brick. The top is protected with a large flat stone about six inches above the ground level. This protection seems to be adequate, though there is some chance of pollution reaching the well through the hole provided for the pump suction. The formation pierced could not be ascertained, but probably consists of loose material. The location is in a small valley which was formerly, no doubt, occupied by a small water course. The sides of the valley above the well are very thickly built upon and nearly all the houses are provided with privy vaults. The worst feature is a privy scarcely 25 feet distant on the up hill side. This privy belongs to the neighboring house in which it is said a case of typhoid fever occurred in the early part of the year. As the family had moved away and the case was not reported, no definite information could be obtained concerning it. Aside from the presence of the privy the sanitary condition of the premises were fair. On August 1st and August 15th there oc-

occurred two cases of typhoid (Nos. 80 and 94, Appendix I), among boarders in the house using the well. Still later, August 25th, the landlady herself was taken sick with typhoid fever (Case No. 105, Appendix I). That the cases were from fly infection is hardly likely since the objectionable privy is fairly well protected against the entrance of flies. Furthermore, infection of flies would be more likely to occur during the early stages of a nearby case, that is, before proper disinfection of the feces is begun. The case in question seems very likely to have been infected by the slow leaching of polluting material from the privy to the well. It should also be noted in passing that there were numerous other cases of typhoid in this locality during the present year.

In the analysis the presence of a trace of nitrites, high nitrates, oxygen required and chlorine show the influence of injurious pollution. The rather high number of bacteria and the formation of gas in the dextrose tube shows further the presence of polluting substances. The low ammonias indicate that partial purification has taken place. This is readily explained since the time of sampling was preceded by a dry spell, after which the movement of the ground water was slow, furthermore the nearby privy had been cleaned two weeks previously and the well had not been regularly used since the sickness occurred. The well is undoubtedly dangerous, and should be closed.

*Sample No. 3.* Laboratory No. 5928. From well on northeast corner of Phelps and Boardman streets. This is a shallow dug well and perhaps 20 feet deep. It has been in existence for a great many years and being accessible to the street may be classed as semi-public. Many persons in the neighborhood are known to drink from it. The construction of the well is not known. The material penetrated is river drift. The top is protected by a wooden platform, which on account of its age cannot be counted to give perfect protection from accidental pollution entering the top. The platform is surmounted by a very old fashioned wooden pump. The locality is in the heart of the city and has been thickly built up for many years. There are no privy vaults in the immediate neighborhood. Both on Boardman and Phelps streets there are old large brick sewers carrying domestic sewage from various parts of the town. That the leakage of these may at times be outward as well as inward is entirely possible. In the neighborhood there occurred two cases of typhoid fever (Nos. 63 and 112, Appendix I), among persons habitually using water from this well for drinking purposes. There were also several other cases among persons known to have drunk from this well frequently.

The chemical analyses shown by the presence of nitrites, very high nitrates, oxygen required and chlorine the presence of polluting influences. The high number of bacteria and the formation of gas in dextrose tubes adds to the evidence. Albuminoid ammonia is also present in considerable quantities, but free ammonia is comparatively low. The inference would

be that partial purification had taken place at time of sampling, but not to such a great extent as in samples previously discussed.

The well is not safe and will without doubt grow worse. Owing to its semi-public character it should be closed at once.

*Sample No. 4.* Laboratory No. 5931. Well at 923 Valley Street. This is a dug well probably not more than 20 feet deep. The manner of its construction could not be learned. A few boards form the only protection at the top and its location at the foot of a rather steep slope would make pollution from the top very likely to occur. Water is drawn from the well by an old worn out wooden pump. The formation which the well pierces is not known, but is probably a more or less porous drift material. On the uphill side and at distances varying from 50 to 100 feet there are four or five very poorly constructed privies. At time of inspection all these were filled and in urgent need of being cleaned. The general sanitary conditions of the surrounding premises is bad. Refuse is permitted to lie on the surface of the ground and sink drainage is thrown on the ground near the wells. On August 6th there occurred a case of typhoid fever, (No. 86, Appendix I) in the house adjoining the well. This was followed on Sept. 10th by another case in the same house. On September 2d and September 5th there occurred two other cases among children in this neighborhood (Nos. 21 and 126, Appendix I), both of whom probably drank from this well.

In the chemical analysis all the constituents which indicate injurious pollution are present in large quantities. In the bacterial examination for some reason the number of bacteria was only moderately high but the colon bacillus was present.

The well is without doubt seriously polluted and should be condemned.

*Sample No. 5.* Laboratory No. 5932. Well at entrance to Arcadia Court. This is a drilled well probably about 40 feet deep and is said to be encased to its full depth. The top of the well is protected by a stone slab. Water is drawn from the well by means of an iron pump which is in fairly good working order. The formation pierced by the well is not certainly known, but is probably river drift deposit consisting mostly of gravel and sand. The immediate surroundings of the well are in neat and clean condition. There are no privies within 60 to 75 feet but the well is between two large sewers. There occurred three cases of typhoid fever, (Nos 106, 110 and 115 Appendix I) among persons using this well on August 27, 29 and 31, respectively. In the chemical analysis the presence of rather high oxygen required and considerable nitrates and chlorine show that the well has been subjected to injurious pollution. The presence of the high number of bacteria and the production of gas in the dextrose tube give additional evidence to this view though no colon could be found in a cubic centimeter portion of the sample. The low am-



monias and the absence of nitrites indicate that considerable purification had taken place at time of sampling.

This well should be regarded with suspicion and it would be desirable to have further analyses made after a period of wet weather.

*Sample No. 6.* Laboratory No. 5933. Well at 227 River Street. This is a shallow dug well probably not more than 15 feet deep. It is said the well is loosely stoned upon the inside. The top is covered with poorly laid boards with wide joints that form no adequate protection from pollution entering the top. The formation into which the well is sunk is the drift of the river valley and consists principally of sand and gravel. The general neighborhood contains a large number of privy vaults. Two of these are within 40 feet of the well. The surroundings of the well are untidy and sink drainage and other wastes are thrown on the surface of the ground.

On April 10th there occurred two cases of typhoid (Nos. 40 and 41 Appendix I) in the house using this well. One of the cases, a girl of 13 years, claimed to use only the well water for drinking purposes.

In the sample both the chemical and bacterial analyses indicate the presence of recent organic pollution.

This well should be condemned and filled in at once.

*Sample No. 7.* Laboratory No. 5934. Well at 328 Edwards Street. This is not strictly speaking a well. It was originally a spring issuing from the foot of a rather steep rock formation. Later it was enclosed in a well over which a pump was placed. The well is probably not more than six feet deep, and is protected at the top by means of a stone slab. There are no privies in the immediate neighborhood though there is a dwelling within about 40 feet on the up hill side. About five hundred feet distant on the up hill side is a stone quarry, not now in use, in which a night soil wagon is permitted to stand during the daytime. It is entirely possible for material from this wagon to find its way into the crevices in the rock and thence to the well. This possibility is given added force by the fact that after severe rains the water in the well becomes turbid. The immediate neighborhood in which the well is located is kept in a neat and clean condition. On May 20th and again on August 2nd there occurred cases of typhoid among users of this well (Nos. 55 and 81 Appendix I).

The chemical analysis of this water presents every evidence of pollution. The bacterial count was high and gas was formed in the dextrose tube. The confirmative test for the colon bacillus was not made.

The well is dangerous and should be closed at once.

#### *Public Wells.*

*Sample No. 8.* Laboratory No. 5929. Well at Rayen Avenue School. This is a dug well perhaps 35 feet deep, the exact depth could



not be learned nor could any information be obtained regarding the material pierced. The well is near the school building but near no source of possible pollution other than the school sewer. At the top of the well it is carefully protected from accidental pollution. Water is drawn by means of an iron pump which seems to be in a fair state of repair.

In the chemical analysis the trace of nitrites, and the considerable quantity of nitrates indicate the water to have been subjected to some polluting influence. The fairly low oxygen required and the low ammonias indicate that a considerable degree of purification has taken place before the water reaches the well. The number of bacteria is somewhat higher than desirable in a good well and gas was produced in the dextrose tube. The confirmative test for the colon bacillus failed to show the presence of this organism in 100 cubic centimeters.

The water from this well is indicated to have been safe at time of sampling. Owing to the evidence of past pollution it would be highly desirable to have other analyses made in order to detect any deterioration.

*Sample No. 9.* Laboratory No. 5937. Wheeler Spring. This is a flowing well in the eastern part of the city. Water from this well is sold in considerable quantities all over the city. No information could be obtained concerning the geological formation from which the water comes nor could any information be obtained concerning the depth of the well other than that it is one hundred feet deep. The sample was collected directly from the well casing as it flowed to waste. A large district in the up-hill direction from the well is thickly built upon and the great majority of houses are provided with privies. Owing to the artesian character of the well it is possible that these have had no influence on the quality of the water.

The chemical samples show considerable oxygen required, the presence of more ammonias than is considered desirable in a ground water and a trace of nitrites is also shown. There were no nitrates which is probably explainable by the lack of oxygen encountered in the passage of the water through the ground. It would appear from the foregoing that the water was previously contaminated with decomposing organic matter in moderate quantities and that mineralization had not been completed by the time the water reached Wheeler Spring. On the other hand the bacterial analysis is fairly satisfactory. The bacterial count was low and there was no gas formation in the dextrose tube.

The water cannot be condemned on the evidence of the one analysis above described, but owing to its suspicious character other analyses would be highly desirable.

Attention is called to the rather slovenly way in which the premises about the spring are maintained, and the rather unsanitary manner of handling the water as it is sold about town. The water is conveyed in tank wagons and measured out to purchasers in dilapidated tin cans. The

spring house should be kept scrupulously clean and water should be delivered in steam sterilized bottles only.

*Sample No. 10.* Laboratory No. 6113. Well in Public Square. This well is drilled and protected by a casing but the depth and formation pierced are not definitely known. It is very probable that it is in river drift which has a considerable depth at points in this general locality. The well is in the heart of the business portion of the city and except for the open place in the square is thickly built up. Practically on all sides of the well and within distances not greater than 100 feet are sewers, some of them being old and of large size. The streets nearby are well paved so there is little chance of polluting material finding its way from the surface to the water bearing stratum, in the immediate neighborhood of the well. There were no cases of typhoid fever that could be definitely traced to this well, but this could not be expected of course under any conditions since the well is used regularly by no one. Nevertheless there were several cases among persons claiming to use the well frequently.

The analysis shows the presence of nitrites, high nitrates and chlorine. The bacterial count is large for a drilled well and colon bacillus is present. All of the above indicate the well to be influenced by some source of dangerous pollution. The comparatively low oxygen required and low ammonias show that the pollution has not been recent.

This well should be looked upon with the greatest suspicion. Considering the fact that it is a public well and used by a very large number of people it is believed that the analytical evidence is sufficient to condemn it. Samples taken after a rainy period would probably show worse results than herewith given.

*Sample No. 11.* Laboratory No. 6107. Drilled well at St. Columba's School. This well is in an apparently good location and probably extends into rock formation, though the exact depth is not known. There were five cases of typhoid among users of this well, two of them being coincident (Nos. 27 and 28 Appendix I) but all the cases may be attributable to other causes.

The entire analysis indicates a water of good quality at time of sampling though the presence of turbidity and sediment suggests rather direct connection with the surface of the ground or at any rate a rapid flow of the water through the ground. In either case it is possible that the water may at any time become badly polluted. Further analyses of this well should be made as the present one is not conclusive.

#### *Wells at Industrial Plants.*

*Sample No. 12.* Drilled well at the office of the Ohio Works of the Carnegie Steel Company. This well is 95 feet in depth and is said to be encased for its entire depth. Formation pierced is not known, but is

probably rock in lower depths. There are within 40 feet of the well several newly constructed privies. No cases of typhoid fever were traceable to this well, and a sample was taken from it for comparison with other wells at the same works.

Bacterial analyses only were made. The number of bacteria was low and there was no production of gas in the dextrose tube. Based on the limited analysis made the water at the time of sampling was of good quality from a sanitary point of view.

*Sample No. 13.* Laboratory No. 5919. Drilled well in the yard of the Ohio Works of the Carnegie Steel Company. This well is 90 feet in depth and is protected by a two-inch casing. The formation pierced is not known, but probably consists largely of river drift. The well is protected at the top by a good paving of cement concrete. Water is drawn from the well by means of an iron pump. There are no sources of probable pollution in the immediate vicinity, though it is possible that the underground flow may reach the well from an up-hill direction where there is a considerable built up district. The well is used by about twelve hundred men working in the mill, the water being carried to them by water boys. There were several cases of typhoid fever among workers at this mill, though the conditions of their homes would warrant the assumption that the infection was taken there rather than at the mill.

Chemical analysis indicates the water to be of very good quality. The number of bacteria was low, and no gas was formed in the dextrose tube.

*Sample No. 14.* Drilled well on the hill near the Ohio Works of the Carnegie Steel Company. This is a shallow drilled well. The actual depth is not known but it is probably not over 40 feet. The top of the well is not properly protected and water is drawn by means of a dilapidated wooden pump. Nearby is an unoccupied dwelling and within 60 feet is a poorly constructed privy. Sanitary condition of the surroundings are generally bad. This well is said to have been used occasionally by a number of men employed at the mill.

Bacterial analysis only was made which showed a high number of bacteria and gas formation in the dextrose tube. The confirmative test for colon bacillus was not made. This well undoubtedly is receiving pollution from some source.

*Sample No. 15.* Laboratory No. 5925. Well at lower Carnegie Steel Company's mill. This is a drilled well probably of considerable depth. The formation pierced is probably river drift. It is located immediately back of the office of the works and within 60 feet of several privies. The top of the well is carefully protected from accidental pollution by a wooden platform. Water is drawn from the well by means of an iron pump in good repair. The water is furnished to practically all the hands of the mill by water boys. It was noticed while collecting samples that persons made a practice of getting a drink by holding a hand

over the mouth of the pump. The hands of some of these men who came for a drink were very dirty and the practice should be discouraged. There were no cases of typhoid fever directly traceable to this well, though several cases occurred among employes in the mill.

The chemical analysis indicates by the presence of high oxygen required, high free ammonia, a trace of nitrites, and high chlorine that the water has received some injurious pollution. On the other hand the number of bacteria was very low and no gas was formed in the dextrose tube. This would tend to indicate that the water before reaching the well had received ample filtration by its passage through the ground. At the time of sampling the water was satisfactory for drinking purposes. It is possible that this water may deteriorate at any time and it would be advisable later to examine another sample from this source.

*Sample No. 16.* Well at the Lloyd, Booth Works. This is a 36-foot dug well loosely stoned up. The top is protected by a wooden platform which does not afford perfect protection from accidental pollution at the top. The formation pierced is river drift. There are no privies in the immediate vicinity of the well though it is located near a thickly built up portion of the town in which there are a number of privies and also several large sewers. There were no cases of typhoid directly traceable to this well.

Bacterial analysis only was made of the sample. The number of bacteria proved to be high and gas was formed in the dextrose tube. The confirmative test for the colon bacillus was not made. From the meager analytical evidence this well would appear to be of poor quality. Further analysis should be made.

*Sample No. 17.* Laboratory No. 5927. Drilled well No. 1 at the Republic Works of the Brown-Bonnell Steel Company. This well is perhaps 80 feet deep and penetrates the river drift. It is located immediately alongside an old dug well, which has been abandoned on account of poor quality. The new well is encased for its entire depth and is protected at the top by a steel plate. Water is drawn by means of an iron pump in good repair. There is no probable source of pollution in the immediate neighborhood of the well. There is a large sewer, however, which passes by at a distance of several hundred feet and on the side from which the ground water would probably flow. There were no cases of typhoid fever directly traceable to this well though there occurred several cases among workers at the mill.

Only partial analysis was made of the sample which shows a trace of nitrites, and a moderate amount of nitrates. The bacteria were low, no gas was formed in the dextrose tube, and no colon bacilli were found in a one hundred cubic centimeter portion, it would appear that the water at time of sampling was of good quality for drinking purposes. It would be advisable to make analysis from time to time in order to detect any



deterioration that might occur. It may be here stated that the Brown-Bonnell Steel Company has analysis of its wells made annually.

*Sample No. 18.* Well No. 2, of the Republic Works of the Brown-Bonnell Steel Company. This is a drilled well, in about the central portion of the plant. The exact depth could not be ascertained, but it is probably in the neighborhood of 80 feet. The well is encased throughout its entire depth, and penetrates the river drift. About 40 feet distant is a large privy, material from which is carried off by a constant flowing stream of water in a large sewer under it. The sewer referred to under Sample No. 17 is within a few hundred feet of this well, and on the side from which the underground flow would probably come. Bacterial analyses only were made of this water, and showed the presence of a rather high number of bacteria and the formation of gas in the dextrose tube. From the limited analysis the well can not be pronounced as bad, but it is at least suspicious. It would be highly advisable to have complete bacterial and chemical analyses made as soon as practicable.

*Sample No. 19.* Well No. 3, at the Republic Works of the Brown-Bonnell Steel Company. This well is located near the Bessemer plant. It is about 80 feet deep, is drilled and is encased for its entire depth. The formation pierced is river drift. The sewer previously referred to, under Samples Nos. 17 and 18, passes near this well, but its exact location could not be learned.

Only the bacterial analysis of the sample was made. This showed a moderately high number of bacteria and the formation of gas in the dextrose tube. The confirmative test for colon bacillus was not made. From the limited analysis this well cannot be condemned, though it should be suspicioned, and complete bacterial and chemical analyses should be made as soon as practicable.

*Sample No. 20.* Laboratory No. 5930. Spring on Monroe Street. This spring emerges from a hillside on Monroe Street and has for a considerable length of time been used for drinking purposes by the employes at the Lower Valley mill of the Brown-Bonnell Steel Company. Until recently the spring has not been well protected. The yard in which it is located was always considerably littered with rubbish of various sorts and there existed the possibility of sink drainage and other waste entering the spring.

Recently the Steel Company has encased the spring in a shallow well, consisting of three lengths of 24-inch vitrified sewer pipe. The ground was graded to a level near the top of the well. Water now rises from the bottom of the above described casing and overflows the top in a small stream, which is carried through a conduit to a nearby sewer. The formation from which this spring derives its supply is not known, but it would appear to come from beneath a thin impervious layer of clay, which is known to exist in this neighborhood. The surroundings of the spring are anything but prepossessing. On the up-hill side and



forming almost a semi-circle about the well are half a dozen or more poorly constructed privies, none of which are more than 75 feet distant. The yard in which the spring is located, at time of sampling, was in a rather neat and clean condition, but such was not the case previous to the first of September. There was one case of typhoid fever No. 14, Appendix I) in the house on the property on which this spring is located. There also occurred several other cases among employes in the mill which was furnished water from this spring.

Bacterial analysis indicates by the presence of high nitrites, nitrates and chlorine the presence of some polluting influence. On the other hand the oxygen required and ammonias are fairly low. Bacteria were not excessive for a spring water, and no gas was produced in the dextrose tube. This would indicate the water to have undergone considerable purification. It also appears from the analysis that the water must come from some distance and is not influenced by pollution in the immediate neighborhood. At the time of sampling the water was probably safe for drinking purposes, though it is likely to deteriorate at any time. Further samples should be analyzed in order to detect such deterioration.

*Sample No. 21.* Well at the Upper Valley Mills of the Brown-Bonnell Steel Company. This is a dug well not over 30 feet deep. No data could be obtained regarding the formation pierced. The well is protected at the top by a wooden platform and water is drawn from the well by means of an iron pump in good condition. A great majority of men working in the Upper Valley Mill used this well for drinking purposes. It is located at the foot of a rather steep hill which seems to be composed of drift. On top of the hill and within several hundred feet of the well is a sprinkling of houses all of which are provided with poorly constructed privies. No specific cases of typhoid fever were traceable to this well, though several occurred among employes of the mill.

Only bacterial analysis of the water was made, this showed the presence of a low number of bacteria for a dug well but also showed the formation of gas in the dextrose tube. A confirmative test for the colon bacillus was not carried out. It would appear that the well is of fair quality, but it is advisable to make a more complete analysis.

*Sample No. 22.* Laboratory No. 5935. Well No. 1, at Youngstown Sheet Steel and Tube Company's plant. This is a dug well not over 18 feet in depth and is protected by 24-inch vitrified tile casing. The formation pierced is river drift, and water is found at a depth of 15 feet below the surface. Forty feet away from the well and on the side from which the underground flow would probably come is a well constructed sewer belonging to the company. Within 50 feet of the well is a large privy belonging to the company, which is made perfectly water tight by means of a heavy concrete bottom. The material from this privy is carried off by a constantly flowing stream in a large sewer beneath it. The

well is used by the men at the Sheet Mill, and throughout the central portion of the plant.

Chemical analysis of the sample showed the water to be of good quality, though there is slight evidence of some polluting influence in the moderately high nitrites and chlorine. The bacterial count is also low for a dug well, there was no gas formation in the dextrose tube and the confirmative test for colon bacillus was negative when one cubic centimeter of the sample was taken.

While the well is of apparently good quality at the present time it would be advisable to have analyses made from time to time, owing to the proximity of a possible source of pollution.

*Sample No. 23.* Laboratory No. 5936. Well No. 2, at the Youngstown Sheet Steel and Tube Company's Mill. The well is located near the Puddle Mill and used by a considerable number of men at that place. The well is 18 feet deep and is protected by 24-inch vitrified tile casing. Formation pierced is river drift. The well is rather poorly protected at the top by means of a wooden platform. There is apparently no immediate source of pollution near this well though a large privy is about one hundred yards distant. It is stated that there is probably a sewer near the well, but this could not be verified.

Chemical analysis shows in all the determinations a dangerous amount of pollution. The bacterial count is high and gas was formed in the dextrose tube. It is possible that pollution reaches this well through the top, and it would, therefore, be advisable to have the platform over it reconstructed and the well thoroughly cleaned. Another analysis of the water should be made, and if no improvement is noted the well should be abandoned. The well principally used for drinking purposes at the Youngstown Sheet Steel and Tube Company is a deep drilled well belonging to the Pittsburg and Lake Erie Railroad Company. The formation pierced is river drift for a considerable depth and then rock. The depth of the well is not known, but is said to be over one hundred feet. There is no source of possible pollution in the vicinity. The water is no doubt of good quality. There were a number of cases of typhoid fever occurring in the Sheet Steel Works and some of them were coincident in point of time. Owing to the practice by employes of occasionally drinking raw river water, which is piped throughout the plant for cooling purposes it is more than likely that the infection was contracted from this source rather than from the well water furnished by the company.

## APPENDIX IV.

## TABLES USED AS BASES FOR DIAGRAMS.

The following tables contain the figures upon which Diagrams IV to XIV are based. The Youngstown figures were obtained from the records of the Youngstown board of health and the U. S. Weather Bureau. All other figures were taken direct from the paper of Sedgwick and Winslow entitled, "Statistical Studies on the Seasonal Prevalence of Typhoid Fever in Various Countries and Its Relation to Seasonal Temperature," published in the Memoirs of the American Society of Arts and Sciences, March 12, 1902.

A table giving cases of typhoid fever in Youngstown, as reported by physicians to the Youngstown department of health, is also submitted. It will be noted that if the typhoid fever death rate is assumed to be 10 or 11 per cent. of the cases, scarcely more than half of all cases have been reported as required by law.

## BALTIMORE.

(See Diagram IV.)

## MONTHLY TYPHOID DEATHS.

FROM REPORTS, LOCAL DEPARTMENT OF HEALTH.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	7	8	6	6	5	10	4	26	34	21	17	17
1889 .....	15	7	14	4	12	16	8	30	26	14	19	26
1890 .....	10	12	15	19	13	13	29	36	30	34	25	11
1891 .....	15	8	3	5	9	6	9	14	22	29	17	13
1892 .....	13	9	8	9	11	8	16	30	26	29	21	13
1893 .....	20	5	11	10	4	13	23	33	32	27	34	12
1894 .....	12	8	6	14	14	8	18	39	28	31	21	23
1895 .....	11	11	6	9	7	3	24	12	27	31	19	13
1896 .....	7	11	4	11	11	13	19	23	29	28	22	10
1897 .....	7	8	6	6	6	8	13	36	36	27	19	17
Average .....	12.7	8.9	7.9	9.3	9.2	9.8	16.3	27.9	29.0	27.1	21.4	15.5
Ratio of 100..	6.6	4.6	4.1	4.8	4.8	5.1	8.4	14.4	15.0	14.0	11.1	8.0

## MEAN MONTHLY TEMPERATURE.

FROM "MONTHLY WEATHER REVIEW," U. S. WEATHER BUREAU.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	29	35	37	53	63	73	74	75	64	51	47	36
1889 .....	39	31	43	55	66	71	77	74	66	54	48	46
1890 .....	44	43	42	54	64	75	75	74	68	57	48	35
1891 .....	38	41	39	56	62	71	72	74	71	55	44	44
1892 .....	32	37	37	52	63	76	76	76	66	56	44	33
1893 .....	25	34	40	53	61	72	77	75	67	57	44	39
1894 .....	37	34	48	52	65	73	78	73	71	57	43	38
1895 .....	31	26	41	53	62	74	73	77	72	53	47	39
1896 .....	34	36	38	57	69	71	78	76	68	55	51	36
1897 .....	32	37	45	53	63	70	77	74	69	58	46	39
Average .....	34	35	41	54	64	73	76	75	68	55	46	38

## NEW YORK CITY.

(See Diagram V.)

## MONTHLY TYPHOID DEATHS.

FROM REPORTS, STATE BOARD OF HEALTH.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1887 .....	28	13	21	11	11	16	33	51	53	38	26	22
1888 .....	12	14	13	11	23	11	35	42	82	52	37	33
1889 .....	27	15	21	18	15	19	31	71	57	57	40	21
1890 .....	20	28	13	12	11	11	31	49	64	49	34	29
1891 .....	14	11	17	13	20	23	28	57	65	56	51	29
1892 .....	15	25	17	19	23	23	52	53	57	55	31	30
1893 .....	22	19	29	25	29	23	21	35	42	70	41	26
1894 .....	22	11	17	18	11	14	28	42	57	46	32	28
1895 .....	17	16	8	14	13	23	27	37	46	48	37	36
1896 .....	20	17	11	12	10	13	25	42	38	39	34	36
Average .....	19.7	16.9	16.7	15.3	16.6	17.6	31.1	47.9	56.1	51.0	36.3	29.0
Ratio of 100..	5.6	4.8	4.8	4.2	4.8	5.1	8.7	13.5	15.8	14.4	10.1	8.2

## MONTHLY TEMPERATURE.

FROM "MONTHLY WEATHER REVIEW," U. S. WEATHER BUREAU.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	26	32	32	48	58	71	70	72	63	49	45	34
1889 .....	38	28	41	52	62	70	73	71	66	52	47	41
1890 .....	40	40	37	51	61	70	73	72	67	55	46	31
1891 .....	35	37	38	52	60	70	71	74	70	54	44	42
1892 .....	30	33	35	50	59	72	75	74	66	55	43	31
1893 .....	23	30	36	48	59	69	75	74	64	58	44	35
1894 .....	35	30	44	50	61	71	76	73	70	57	42	37
1895 .....	30	25	36	48	59	70	71	74	70	51	46	37
1896 .....	28	30	32	50	64	66	73	73	65	52	48	32
1897 .....	29	33	39	49	59	65	73	71	65	56	44	36
Average .....	31	32	37	50	60	69	73	73	67	54	45	36



## DENVER.

(See Diagram VI.)

## MONTHLY TYPHOID DEATHS.

FROM REPORTS, LOCAL DEPARTMENT OF HEALTH.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	8	1	3	0	2	5	14	22	24	31	21	3
1889 .....	4	0	1	1	4	1	14	23	51	55	22	12
1890 .....	7	5	2	1	9	7	17	31	56	72	50	30
1891 .....	13	9	4	3	2	3	6	11	15	17	9	7
1892 .....	2	1	2	3	2	6	2	12	9	9	15	1
1893 .....	4	4	0	5	8	5	8	4	5	10	15	3
1894 .....	4	2	1	1	3	6	3	8	8	7	48	8
1895 .....	5	1	2	1	2	2	2	5	8	6	8	2
1896 .....	5	0	2	1	4	0	6	13	28	17	12	3
Average .....	5.8	2.6	1.9	1.8	4.0	3.9	8.0	15.4	22.7	24.9	22.2	7.7
Ratio of 100..	4.8	2.1	1.6	1.5	3.3	3.2	6.7	11.9	18.9	20.7	18.5	6.4

## MEAN MONTHLY TEMPERATURE.

FROM "MONTHLY WEATHER REVIEW," U. S. WEATHER BUREAU.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	27	39	33	53	53	68	71	65	61	48	34	34
1889 .....	27	30	43	51	55	64	72	73	60	52	32	40
1890 .....	28	34	41	48	58	68	72	69	62	49	40	39
1891 .....	25	27	32	48	56	63	70	69	64	52	38	31
1892 .....	26	33	36	46	51	65	72	71	66	50	43	27
1893 .....	38	31	38	45	54	69	73	70	63	51	39	38
1894 .....	31	25	40	50	59	66	72	71	63	54	45	32
1895 .....	28	27	37	50	56	62	67	70	66	51	38	34
1896 .....	37	38	37	50	59	68	72	72	61	50	36	39
1897 .....	27	31	36	47	61	65	70	70	66	51	41	38
Average .....	29	31	37	49	56	66	71	70	63	51	39	34

## BOSTON.

(See Diagram VII.)

## MONTHLY TYPHOID DEATHS.

FROM REPORTS, LOCAL DEPARTMENT OF HEALTH.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	7	6	5	11	3	11	11	19	31	42	17	18
1889 .....	6	7	7	7	9	12	17	35	33	23	17	13
1890 .....	7	5	7	7	7	8	9	20	27	20	19	19
1891 .....	8	4	11	9	8	4	7	14	29	29	15	16
1892 .....	2	5	7	7	9	6	6	15	18	29	18	15
1893 .....	13	9	6	10	13	12	7	15	14	26	17	6
1894 .....	3	6	5	7	7	4	4	18	30	27	20	11
1895 .....	8	3	6	7	11	8	9	26	28	26	13	18
1896 .....	14	6	2	5	6	7	8	13	30	34	23	14
1897 .....	14	7	9	11	8	9	10	25	27	22	18	13
Average .....	8.1	5.6	6.5	8.1	8.1	8.1	8.8	20.0	26.7	27.8	17.7	14.3
Ratio of 100..	5.1	3.5	4.1	5.1	5.1	5.1	5.5	12.5	16.7	17.4	11.1	8.9

## MEAN MONTHLY TEMPERATURE.

FROM "MONTHLY WEATHER REVIEW," U. S. WEATHER BUREAU.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	20	28	32	42	52	67	68	69	59	47	43	34
1889 .....	36	26	38	48	60	69	69	67	63	48	45	38
1890 .....	32	33	35	46	57	64	74	70	63	51	42	26
1891 .....	31	32	34	48	56	65	69	70	67	52	41	40
1892 .....	28	28	33	48	56	70	73	70	62	53	41	30
1903 .....	21	27	34	44	56	65	71	70	60	55	42	30
1894 .....	30	27	42	47	58	69	74	68	65	54	38	32
1895 .....	29	25	35	46	60	67	69	71	66	50	45	36
1896 .....	25	29	32	47	60	66	72	71	62	50	46	30
1897 .....	28	31	37	49	58	62	72	70	63	54	41	34
Average .....	28	29	35	46	57	66	71	70	63	51	42	33

## EMPIRE OF JAPAN.

(See Diagram VIII.)

## MONTHLY TYPHOID DEATHS.

FROM ANNUAL REPORTS OF THE CENTRAL SANITARY BUREAU OF JAPAN.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1890 .....	568	386	380	402	540	527	603	838	1159	1309	977	775
1891 .....	556	285	264	392	724	1038	1028	940	1255	1286	1009	837
1892 .....	541	382	366	405	468	628	734	938	1165	1252	921	729
1893 .....	508	361	368	340	450	520	646	827	1190	1262	1016	695
1894 .....	515	319	226	256	338	515	681	1069	1298	1141	995	702
Average .....	538	347	321	359	504	546	738	922	1203	1250	984	748
Ratio of 100...	6.3	4.1	3.8	4.2	5.9	7.5	8.6	10.8	14.1	14.6	11.5	8.8

## MEAN MONTHLY TEMPERATURE. (10 STATIONS.) (3-6 YEARS.)

FROM "THE CLIMATE OF JAPAN," CENTRAL METEOROLOGICAL OBSERVATORY,  
TOKIO, 1893.

Stations.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Kumamoto ..	3	7	10	16	19	22	26	27	25	18	12	8
Metsuyama ..	4	6	8	13	17	21	25	26	23	17	12	9
Hiroshima ..	3	5	8	13	19	22	25	27	23	17	11	7
Ozaka .....	4	3	9	14	18	22	26	27	24	17	12	7
Wakayama ..	5	5	9	14	18	22	26	27	23	17	12	8
Nagano .....	-2	0	4	11	14	19	23	24	20	12	7	4
Tokio .....	3	4	7	13	16	21	24	26	22	16	11	6
Hakodate ...	-4	-2	3	7	11	14	18	21	18	11	5	1
Sappore .....	-7	-5	0	5	11	15	19	21	17	9	3	-1
Nemuro .....	-6	-5	-1	4	7	10	15	18	16	10	4	0
Average °C...	0	2	6	11	15	19	23	24	21	14	9	5
Fahrenheit ...	32	36	43	52	59	66	74	75	70	58	48	41

## CINCINNATI.

(See Diagram IX.)

## MONTHLY TYPHOID DEATHS.

FROM REPORTS, LOCAL DEPARTMENT OF HEALTH.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	41	34	16	11	6	7	6	12	17	16	22	13
1889 .....	11	14	11	19	7	9	12	14	14	11	12	9
1890 .....	18	11	17	9	14	14	23	24	20	23	23	9
1891 .....	10	17	14	21	14	21	10	16	7	22	22	12
1892 .....	17	10	8	4	4	7	6	10	12	9	11	23
1893 .....	10	14	8	4	14	6	8	15	14	12	12	17
1894 .....	18	11	15	10	10	8	12	6	10	21	11	37
1895 .....	22	12	7	6	5	5	7	7	8	10	8	23
1896 .....	34	22	15	11	11	5	6	14	9	11	11	15
1897 .....	9	8	5	5	10	3	17	9	9	9	6	11
Average .....	19.0	15.3	12.6	10.0	9.5	8.5	10.7	12.7	12.0	14.4	13.8	17.1
Ratio of 100..	12.3	9.9	8.2	6.5	6.2	6.5	6.9	8.2	7.8	9.4	8.9	11.1

## MEAN MONTHLY TEMPERATURE.

FROM "MONTHLY WEATHER REVIEW," U. S. WEATHER BUREAU.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	29	35	39	55	63	74	76	73	63	50	45	36
1889 .....	37	30	46	54	63	70	75	72	66	52	43	48
1890 .....	41	43	40	56	64	78	77	73	66	56	48	36
1891 .....	36	40	38	56	60	74	71	72	70	55	43	42
1892 .....	26	39	38	53	62	75	76	75	68	56	40	32
1893 .....	21	34	42	54	61	73	79	75	70	56	42	36
1894 .....	38	33	49	54	63	75	77	77	72	57	41	37
1895 .....	27	24	41	55	64	76	75	77	73	51	44	37
1896 .....	34	35	37	62	71	73	76	75	65	53	48	38
1897 .....	29	36	46	52	59	72	78	74	71	63	46	36
Average .....	32	35	42	55	63	74	76	74	68	55	44	38

## PHILADELPHIA.

(See Diagram X.)

## MONTHLY TYPHOID DEATHS.

FROM REPORTS, LOCAL DEPARTMENT OF HEALTH.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	63	46	40	37	84	49	62	169	100	67	36	32
1889 .....	62	79	61	41	64	50	68	83	70	63	33	66
1890 .....	126	54	52	52	51	36	56	62	57	47	39	34
1891 .....	50	44	102	141	76	42	49	42	53	35	23	26
1892 .....	51	68	51	37	30	24	20	40	44	37	11	27
1893 .....	43	34	38	35	61	37	26	47	47	29	25	35
1894 .....	43	18	20	25	36	24	29	50	34	31	29	31
1895 .....	36	64	48	40	39	38	33	36	32	43	30	30
1896 .....	34	23	21	40	46	27	31	38	34	17	28	63
1897 .....	36	18	27	41	50	32	25	49	24	20	31	48
Average .....	54	45	46	49	54	36	40	62	49	39	28	39
Ratio of 100..	10.0	8.2	8.4	9.0	10.0	6.7	7.4	11.5	9.0	7.2	5.2	7.2

## MEAN MONTHLY TEMPERATURE.

FROM "MONTHLY WEATHER REVIEW," U. S. WEATHER BUREAU.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	28	34	35	51	61	73	72	74	64	50	46	36
1889 .....	39	29	42	53	65	71	75	73	66	53	47	44
1890 .....	42	41	39	52	63	74	75	74	67	55	46	32
1891 .....	36	40	38	54	61	72	72	74	72	55	44	43
1892 .....	31	35	36	51	62	74	77	76	67	56	44	33
1893 .....	24	32	39	51	61	72	77	76	66	58	44	36
1894 .....	37	32	47	51	64	73	78	73	70	57	42	37
1895 .....	31	25	38	52	62	74	73	77	72	53	47	39
1896 .....	31	34	36	55	67	70	78	77	68	54	50	35
1897 .....	31	36	43	53	63	69	76	74	68	58	46	38
Average .....	33	34	39	52	63	72	75	75	68	55	46	37



## CHICAGO.

(See Diagram XI.)

## MONTHLY TYPHOID DEATHS.

FROM REPORTS, LOCAL DEPARTMENT OF HEALTH.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1889 .....	30	21	15	12	16	18	29	64	77	68	68	35
1890 .....	53	136	103	45	82	107	86	115	95	72	67	47
1891 .....	67	61	71	136	408	167	200	182	198	171	150	186
1892 .....	311	187	76	56	70	55	211	179	138	92	67	47
1893 .....	41	30	41	58	56	60	55	76	86	81	43	43
1894 .....	46	26	27	30	31	31	37	52	71	68	38	34
1895 .....	30	21	26	30	30	18	36	59	76	90	60	42
1896 .....	87	89	65	33	31	44	58	64	87	89	60	44
1897 .....	38	46	41	19	13	23	27	42	48	61	44	35
1898 .....	29	32	41	94	67	35	55	45	65	62	56	35
Average .....	75	59	51	51	80	56	79	88	94	85	65	57
Ratio of 100..	8.8	7.0	6.0	6.0	9.5	6.7	9.4	10.5	11.2	10.1	7.7	6.8

## MEAN MONTHLY TEMPERATURE.

FROM "MONTHLY WEATHER REVIEW," U. S. WEATHER BUREAU.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	15	23	30	45	53	67	72	69	60	48	41	31
1889 .....	29	20	38	47	57	62	70	71	63	49	39	41
1890 .....	31	32	29	46	53	70	72	68	60	51	42	31
1891 .....	30	29	31	47	53	66	67	69	69	53	34	35
1892 .....	19	30	31	44	52	64	72	71	64	54	35	23
1893 .....	12	21	33	44	52	68	74	70	64	53	36	25
1894 .....	27	23	41	47	56	71	73	71	66	52	34	32
1895 .....	18	17	32	46	59	70	70	72	69	46	36	30
1896 .....	27	27	31	53	65	67	72	73	61	50	38	33
1897 .....	22	29	35	46	55	65	74	69	69	58	39	25
Average .. .	23	25	33	46	55	67	72	70	64	51	37	32

## PARIS.

(See Diagram XII.)

## MONTHLY TYPHOID DEATHS.

FROM "ANNUAIRE STATISTIQUE DE LA VILLE DE PARIS."

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N. <sup>°</sup>	D.
1888 .....	146	78	52	58	54	52	81	51	70	65	69	71
1889 .....	69	62	57	43	53	71	102	153	120	92	84	208
1890 .....	74	39	45	47	51	57	44	54	76	92	71	73
1891 .....	65	59	53	47	36	30	37	43	40	39	54	46
1892 .....	50	36	48	37	48	78	90	89	97	105	62	59
1893 .....	48	49	50	47	29	29	63	73	72	48	33	29
1894 .....	25	53	289	84	34	46	33	37	21	22	29	24
1895 .....	11	9	13	21	13	25	22	30	43	34	24	26
1896 .....	35	17	21	10	25	9	30	35	26	17	28	9
Average .....	52	40	63	39	34	40	50	56	56	51	45	54
Ratio of 100..	9.0	6.9	10.9	6.7	5.9	6.9	8.6	9.7	9.7	8.8	7.7	9.3

## MEAN MONTHLY TEMPERATURE.

FROM "ANNUAIRE STATISTIQUE DE LA VILLE DE PARIS."

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	1	0	4	7	13	16	16	16	15	8	8	3
1889 .....	1	2	4	9	15	19	18	17	14	10	6	0
1890 .....	6	2	6	9	14	15	16	17	15	9	6	-3
1891 .....	-1	3	6	8	12	16	17	16	15	12	5	5
1892 .....	2	4	4	10	15	17	18	19	15	9	8	1
1893 .....	-1	6	9	14	14	18	19	20	15	11	5	3
1894 .....	3	5	8	12	12	16	18	17	14	10	7	4
1895 .....	0	-4	5	11	14	16	18	18	19	9	9	5
1896 .....	2	3	9	9	13	17	19	16	15	9	3	4
Average °C..	1	2	5	9	13	16	17	17	15	9	6	2
Fahrenheit ..	34	36	41	48	55	61	63	63	59	48	43	36

## BERLIN.

(See Diagram XIII.)

## MONTHLY TYPHOID DEATHS.

FROM "VEROFFENTLICHUNGEN DES KAISERLICHEN GESUNDHEITSAMTES."

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	38	19	10	11	8	10	18	22	13	15	11	13
1889 .....	11	21	58	23	14	11	28	20	23	18	36	27
1890 .....	14	15	11	9	10	8	10	16	18	18	9	5
1891 .....	9	7	16	7	9	9	7	20	19	31	20	12
1892 .....	12	6	15	7	10	10	7	9	23	15	10	13
1893 .....	7	6	11	8	13	8	7	19	42	16	18	5
1894 .....	7	9	8	7	7	5	7	5	10	10	5	12
1895 .....	6	7	8	2	4	14	8	16	22	17	8	14
1896 .....	9	6	6	11	8	6	11	14	17	11	4	5
1897 .....	3	1	8	8	5	4	4	20	11	10	7	9
Average .....	11.6	9.7	15.1	9.3	8.8	8.5	10.7	16.1	19.8	16.1	12.8	11.5
Ratio of 100..	8.0	6.7	10.0	6.0	6.0	5.3	7.3	10.7	13.3	10.7	8.7	7.3

## MEAN MONTHLY TEMPERATURE.

FROM "ERGEBNISSE DER METEOROLOGISCHEN BEOBACHTUNG VON DEM KOENIG-  
LICH PREUSSISCHMN METEOROLOGISCHEN INSTITUT."

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1888 .....	-1	-2	0	7	14	17	17	17	15	8	4	2
1889 .....	-2	-1	1	9	19	22	18	17	13	9	4	0
1890 .....	3	-1	6	9	16	16	18	19	15	9	4	-4
1891 .....	-3	1	4	6	15	16	18	17	16	11	4	3
1892 .....	-1	1	2	8	13	17	18	20	16	9	2	-1
1893 .....	-7	2	5	9	13	17	19	18	13	11	3	1
1894 .....	-1	3	6	11	13	16	20	17	12	9	5	1
Average °C..	-2	0	3	8	15	17	18	18	14	9	4	0
Fahrenheit ..	28	32	37	46	59	63	64	64	57	48	39	32

## YOUNGSTOWN.

(See Diagram XIV.)

## MONTHLY TYPHOID DEATHS.

FROM RECORDS, LOCAL DEPARTMENT OF HEALTH.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Total
1893 .....	1	0	0	1	0	0	1	1	1	2	0	1	8
1894 .....	1	1	0	1	0	0	1	2	2	1	2	2	13
1895 .....	0	0	1	2	3	0	1	0	2	1	0	1	11
1896 .....	1	0	0	1	4	1	1	4	4	5	1	0	22
1897 .....	4	1	1	1	0	2	0	2	1	1	4	3	20
1898 .....	3	2	3	3	1	4	1	1	2	1	1	6	28
1899 .....	6	7	4	8	4	0	2	2	4	8	7	2	54
1900 .....	3	7	8	8	1	1	0	1	2	3	4	1	39
1901 .....	2	1	1	8	13	4	3	4	5	7	6	5	59
1902 .....	7	7	3	7	7	3	2	5	6	4	4	4	59
1903 .....	6	13	17	10	9	5	1	2	5	5	3	3	79
1904 .....	4	6	8	10	1	1	2	3	4	0	0	5	44
1905 .....	1	2	4	5	5	1	2	4	2	2	2	0	30
Average .....	3.0	3.6	3.8	5.0	3.7	1.7	1.3	2.4	3.1	3.1	2.6	2.5	35.8
Ratio of 100..	8.4	10.1	10.7	13.9	10.3	4.7	3.7	6.6	8.6	8.6	7.3	7.1	100.0

## MEAN MONTHLY TEMPERATURE.

FROM U. S. WEATHER BUREAU.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
1893 .....	17	27	34	48	58	71	74	69	63	51	38	31
1894 .....	31	26	43	49	59	70	73	69	66	52	36	32
1895 .....	22	18	34	50	61	72	69	70	66	45	40	32
1896 .....	27	27	28	53	67	68	72	70	59	46	44	28
1897 .....	23	30	38	47	55	63	72	65	61	53	40	32
1898 .....	31	29	44	47	61	71	75	74	66	53	38	28
1899 .....	27	21	36	.....	.....	.....	.....	72	61	56	43	29
1900 .....	31	24	31	49	.....	69	70	74	66	59	41	30
1901 .....	29	19	38	45	.....	71	77	72	63	52	37	28
1902 .....	25	20	41	46	60	66	74	67	62	53	47	28
1903 .....	27	30	47	48	63	63	71	69	63	52	36	23
1904 .....	20	20	36	42	61	69	71	66	63	51	39	26
1905 .....	23	19	39	46	60	68	73	71	63	52	38	31
Average .....	25.7	23	37.7	47.5	60.4	68.4	72.5	69.7	63.4	51.8	39.7	29

EXPLANATORY NOTE: The above temperature records for the years 1893 to 1898, inclusive, were recorded at Youngstown. The temperature records from 1899 to 1905, inclusive, were obtained from observations taken at Warren and are here given with correction for mean difference of temperature between Youngstown and Warren.

## YOUNGSTOWN.

## CASES OF TYPHOID REPORTED.

## FROM RECORDS, LOCAL DEPARTMENT OF HEALTH.

Year.	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Total
1893 .....	2	2	8	9	11	2	13	16	17	0	8	4	92
1894 .....	9	4	7	5	5	1	2	8	14	18	5	5	83
1895 .....	4	10	8	11	6	5	2	1	11	7	1	5	71
1896 .....	7	1	7	6	15	19	14	29	43	43	16	5	205
1897 .....	17	2	7	11	11	5	6	10	13	15	13	30	140
1898 .....	21	19	18	10	10	6	3	10	12	8	11	19	147
1899 .....	50	31	37	12	21	15	20	26	30	52	40	18	352
1900 .....	38	29	26	32	11	6	8	36	51	32	20	29	318
1901 .....	15	9	10	88	82	38	27	53	59	38	6	12	437
1902 .....	28	4	17	29	13	7	7	45	103	19	10	4	286
1903 .....	30	94	61	43	14	17	10	74	49	16	17	12	437
1904 .....	10	17	19	7	10	6	7	19	18	14	1	2	130
1905 .....	3	0	13	32	11	1	5	28	19	9	0	3	124
Average .....	18.0	17.0	18.3	22.6	16.9	9.8	9.5	36.6	33.8	20.8	11.4	11.4	217



## APPENDIX V.

## CIRCULAR LETTERS SENT TO PHYSICIANS.

The following letters were sent to physicians in general practice in Youngstown for the purpose of obtaining a complete list of typhoid fever cases occurring in that city between January 1, 1906, and the time of the investigation. Ninety-eight physicians were written to. But eight replies were received to the first letter. To the second, forty replies were received, most of them coming in during the ten days following the sending of the letter. Those physicians who did not reply were reached by telephone and the required information was obtained from all but two.

## CITY OF YOUNGSTOWN.

## HEALTH DEPARTMENT.

Telephone 998.

YOUNGSTOWN, OHIO, September 12, 1906.

DR. \_\_\_\_\_,  
City.

DEAR DOCTOR:—The State Board of Health is investigating the present prevalence of typhoid fever in Youngstown with a view to ascertaining the extent to which its occurrence is influenced by the municipal filtration plant.

Without the co-operation of the local physicians the work will be exceedingly difficult and you are therefore respectfully urged to answer as fully and accurately as possible the appended questions. Also give any other information which you may think of value. In order that the expense of the investigation may not be unduly increased and the work unnecessarily prolonged it will be greatly appreciated if you reply at once.

Very truly yours,

(Signed.) PAUL HANSEN,

*Asst. Engineer State Board of Health.*

Give list of all cases of typhoid fever treated by you since January 1, 1906, giving the following information in each case.

Name .....  
Age .....  
Sex .....  
Occupation .....  
Residence (Give street number).....  
Date when patient went to bed.....  
Date of recovery or death.....  
Water supply used .....  
Milk supply— from whom obtained.....  
If possible state where other food supplies are obtained, especially vegetables and fruit eaten raw .....  
General habits of patient and family in which he lives and a description of sanitary conditions of premises .....  
Note any unusual features such as mildness or severity of case, any peculiarity of symptoms, length of time ill before going to bed, etc., etc.....

STATE OF OHIO.  
STATE BOARD OF HEALTH.  
SECRETARY'S OFFICE.

YOUNGSTOWN, O., September 24, 1906.

DR. \_\_\_\_\_, City.

DEAR DOCTOR:—On September 12th, I wrote you requesting certain information concerning typhoid fever cases treated by you during the present year. Fearing that my letter has gone astray or has been overlooked I take the liberty of writing again, asking you to give the following information for each case which you have treated since January 1st, 1906.

1. Name. 2. Age. 3. Sex. 4. Occupation. 5. Residence, and place of business (give street number). 6. Date when patient went to bed. 7. Date of recovery or death. 8. Water supply used. 9. Milk supply—from whom obtained. 10. If possible state where other food supplies are obtained. 11. General habits of patient and family in which he lives with brief description of sanitary condition of premises. 12. Note any unusual features such as mildness or severity of attack, peculiarities of symptoms, length of time ill before going to bed, etc.

If it is found impossible to reply to all of the above, kindly make an effort to send in a complete list of cases with the information requested under 1, 5, 6 and 7. If no cases have been treated a statement to that effect will be of value. Trusting that I may be favored with a prompt reply, I remain,

Very truly yours,

(Signed.) PAUL HANSEN,  
*Asst. Engineer State Board of Health.*

P. S.—Kindly address reply care of Health Department, Youngstown, Ohio.

## APPENDIX VI.

## TABLES SHOWING OPERATION OF FILTER PLANT.

The following tables are compiled from monthly reports made by the superintendent of the filtration plant, Mr. G. R. Patton. The figures given cover the period between March and October, 1906, inclusive:

## FILTRATION REPORT FOR YOUNGSTOWN.

## CHEMICAL.

	March	April	May	June
Gallons Water Filtered, Estimated .....	5,631,000	5,090,000	5,462,354	5,704,000
Pounds Sulphate of Alumina Used .....	1903	1822	2378	2366
Grains per Gal. Sulphate of Alumina Used .....	2.365	2.46	3.00	2.97
Free Carbonic Acid.....	0.1	0.3	0.7	0.72
<i>Parts per Million.</i>				
Alkalinity—				
River Water .....	56	53	78	115
Filtered Water .....	40	38	54	102
Color—				
River Water .....	132	182	156	116
Filtered Water .....	-1	0	0.5	0.4
Chlorine, River Water.....	7.3	5.8	3.4	5.8
Turbidity, River Water.....	436	51	32	28

## CHEMICAL CONTINUED.

	July	August	September	October
Gallons Water Filtered, Estimated .....	5,719,000	5,808,480	5,658,600	5,492,400
Pounds Sulphate of Alumina Used .....	2386	2648	2340	2241
Grains per Gal. Sulphate of Alumina Used .....	2.99	2.97	2.83	2.82
Free Carbonic Acid.....	0.81	0.31	0.4	0.13
<i>Parts per Million.</i>				
Alkalinity—				
River Water .....	111	71	91	50
Filtered Water .....	84	40	70	33
Color—				
River Water .....	148	231	239	239
Filtered Water .....	0	13	0	4.9
Chlorine, River Water.....	3.7	1.7	4.4	1.5
Turbidity, River Water.....	67	103	60	59

## BACTERIAL.

	March	April	May	June
Bacterial Points per cc.—				
River Water .....	40,895	13,852	17,997	176,300
Filtered Water .....	74	-138	369	2,200
Percentage Reduction Efficiency of Filters.....	99.82	99.03	97.8	98.71
B. Coli Communis Found—				
River Water .....	*yes in 22 samples	†yes in 25 samples	‡yes in 19 samples	*yes in 26 samples
Filtered Water .....	*not in 22 samples	†not in 24 samples	‡not in 20 samples	*not in 21 samples
Cost per Million Gallons for Coagulant .....	\$3.38	\$3.33	\$4.33	\$4.10
Percentage of Waste Water..				

\* 22 samples tested.

† 25 samples tested.

‡ 21 samples tested.

\* 26 samples tested.

## BACTERIAL CONTINUED.

	July	August	September	October
Bacterial Points per cc.—				
River Water .....	78,968	63,630	58,940	22,920
Filtered Water .....	1,032	720	610	450
Percentage Reduction Efficiency of Filters.....	98.69	98.73	99.23	98.03
B. Coli Communis Found—				
River Water .....	*yes in 25 samples	†yes in 27 samples	‡yes in 24 samples	*yes in 27 samples
Filtered Water .....	*not in 22 samples	†not in 18 samples	‡not in 19 samples	*not in 20 samples
Cost per Million Gallons for Coagulant .....	\$4.25	\$4.21	\$4.11	\$4.05
Percentage of Waste Water..	5.86	6.67	3.31	6.05

\* 25 samples tested.

† 27 samples tested.

‡ 25 samples tested.

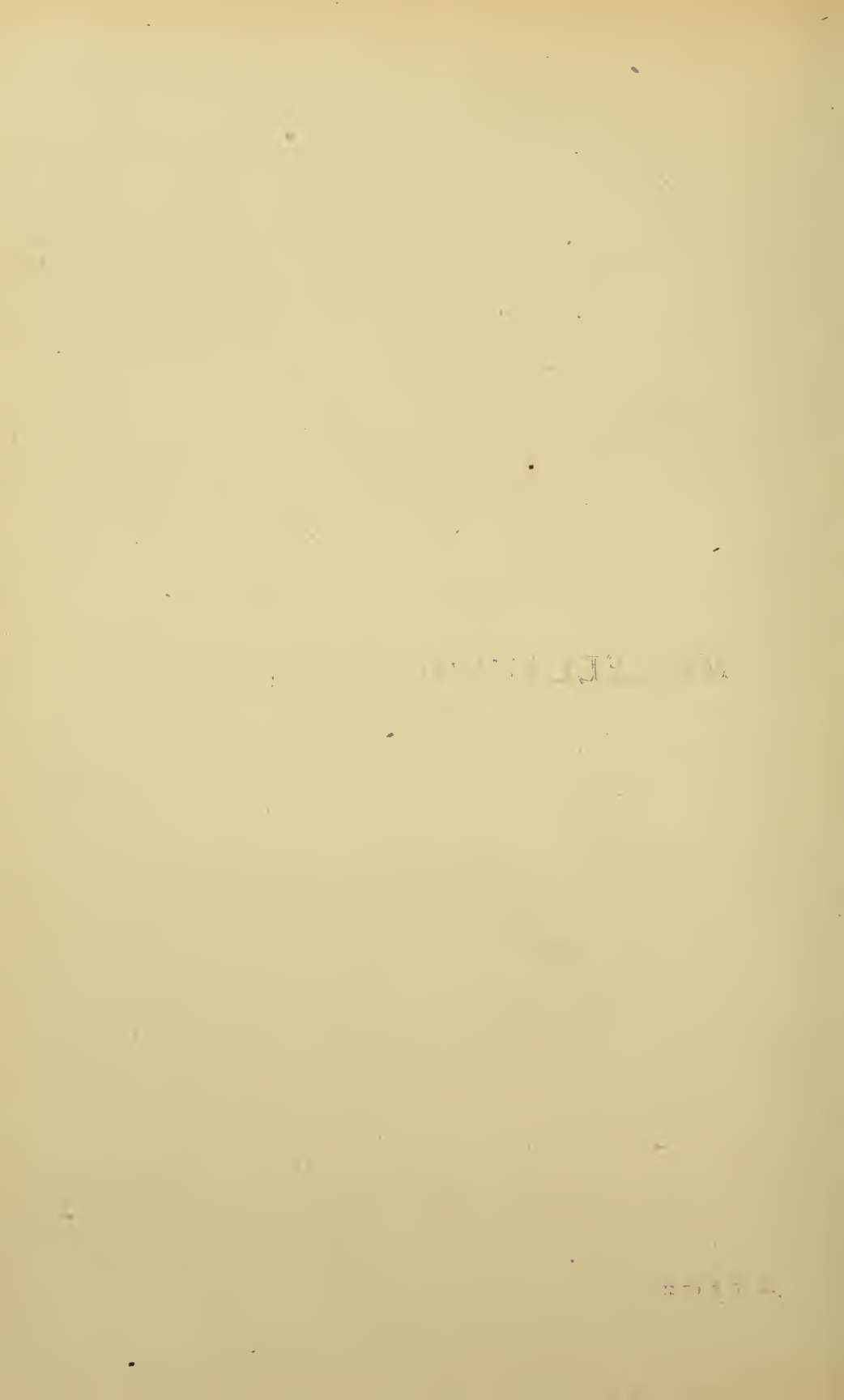
\* 27 samples tested.





# MISCELLANEOUS REPORTS.

(337)



REPORT ON THE INVESTIGATION OF A NUISANCE AT  
BELLAIRE.

On June 6, 1906, a letter was received from a citizen of Bellaire, complaining of a nuisance caused by the discharge of sewage and other wastes into Indian Run.

The assistant engineer visited Bellaire June 11th, examined the conditions complained of and made the following report:

Indian Run, a small stream with a discharge of perhaps several cubic feet per second, running from west to east through the north-central part of the city, discharges into the Ohio River at a point several hundred feet above the water-works intake.

Starting at a point on Indian Run, about 200 feet west of the Noble Street bridge, the stream was found to be quite clear and clean in appearance and is said to contain only minor wastes and surface drainage. Just below this point, an 8-inch iron sewer discharged a considerable amount of domestic waste into the stream. This waste was not sufficient to discolor the stream to any considerable degree yet evidences of pollution were quite noticeable. About 75 feet further down, two 6-inch vitrified pipe sewers discharged a moderate amount of domestic waste. The effect of these was scarcely noticeable in the stream though it might have been had not the stream been previously polluted by the 8-inch sewer above referred to. A short distance below the two 6 inch sewers, perhaps about 100 feet above the bridge, there enters the stream a 20 inch sanitary sewer, running about half full and said to carry the sewage from a population of about 1200. The effect of this sewer on the stream was to greatly discolor it and practically convert it into an open sewer. Directly under the bridge was another domestic sewer, whose outlet was submerged so that its size could not be ascertained. It was said to be 8 inches in diameter, but this is not authentic. It discharged a very large quantity of sewage which added considerably to the already foul condition of the stream. Two 18-inch storm water drains also discharged beneath the bridge and one of these seemed to contain a small flow of domestic sewage. In the neighborhood of the bridge conditions seemed to be the worst and it is from this district that most of the complaints are received. It was testified by the occupants of a saloon and barber shop adjoining the stream that during the hot weather the stench became almost unbearable. A short distance below the bridge the stream enters the works of the Carnegie Steel Company.

In its course through the steel company's yard, a distance of five or six hundred feet, it receives a discharge of two 18-inch drains, carrying large quantities of liquid wastes from the works. These wastes seem to be comparatively clear and they greatly improve the appearance of the water in the stream, and also nearly double its discharge.

On reaching the Ohio River, water from Indian Run is prevented, in a large degree, from flowing over the water-works intake by a ripple in the stream which forces it to stay close to the shore. The intake pipes extend out beyond this ripple. The presence of this ripple probably accounts for the fact, previously noted in examinations made by the State Board of Health, that the water supply is apparently unaffected by sewage from Indian Run.

The condition of Indian Run is undoubtedly very bad, but the only adequate solution of the problem would seem to be the reconstruction of the sewerage of the entire city, so that all the sewage could be carried to a point in the river well below the present water-works intake.

July 11, 1906, a letter was addressed to the mayor and council of Bellaire enclosing a copy of this report and expressing the hope that some action would be taken as soon as possible for the permanent abatement of this nuisance.

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#### REPORT ON THE POLLUTION OF A STREAM AT BROOKSIDE BY WASTES FROM A SLAUGHTER HOUSE.

Complaint having been made to the State Board of Health of the pollution of a small stream in the village of Brookside by the waste from a slaughter house, the assistant engineer visited that village on July 11, 1906, and the following report was made.

The incorporated village of Brookside is located about one mile west of Bridgeport, in the valley of Wheeling Creek, and has a population of about two hundred. It covers a small area. The village is strictly a residential one and is in a way a suburb of Bridgeport; being inhabited almost entirely by business men of the latter place.

The southwesterly boundary of Brookside is formed by a small intermittent stream, known as Slaughter House Run (sometimes called Frazer's Run). Located adjacent to this run and just beyond the corporation limits in a northwesterly direction is a slaughterhouse owned by Burkle and Rehme. The slaughter house has occupied this location for over thirty years. Up to within two or three years ago it was used only occasionally for slaughtering purposes. For the last two or three years, however, the owners have greatly increased their business and now slaughter some 70 animals (principally hogs) each week.

From inquiry of one of the owners it was learned that all the heavier waste materials such as entrails, clippings, undiluted blood, etc., are saved and sold to dealers, who call for them regularly. The water used for general washing purposes, however, is allowed to flow directly to Slaughter House Run. This wash water is said to contain a considerable amount of blood which comes from washing out the carcasses with a hose after they have been drained, and is also charged with grease and with

the general accumulations which occur in the process of killing and dressing meat.

The amount of this water is estimated at from four to eight barrels (120 to 240 gallons) per day.

At the time of inspection the bed of the run below the slaughter house was badly polluted with black putrescible organic matter and green, slimy growths of foul appearance. In the water itself could be seen blood. Owing to recent complaints on the part of occupants of houses located near the stream, the owners of the slaughter house had, the day before the inspection, placed several barrels of lime in the run for the purpose of abating the nuisance. This lime extended for several hundred feet above and below the bridge which passes over the run at its intersection with the main street of the village. This bridge is located about 900 feet below the slaughter house. About 1000 feet below this bridge the run enters Wheeling Creek.

Decidedly offensive odors were being given off by the foul matter in the river at nearly all parts along its course below the slaughter house; while above the slaughter house the stream was clear and colorless and the stream bed clean.

The lime seemed to have little effect in preventing odors and very objectionable conditions were being caused to those living within several hundred feet of the stream.

#### CONCLUSIONS.

1st. Slaughter House Run, forming the westerly boundary of the corporation of Brookside, was found to be badly polluted by wastes from the slaughter house of Burkle and Rehme, located immediately northwest of the corporation and adjacent to the above stream, at a point about 1000 feet above the main street of Brookside.

2nd. The waste water now causing this pollution can be purified by some method of filtration through sand, coke, coal or similar materials before discharging it into the stream.

3rd. The owners of the slaughter house should, as soon as possible, install and operate some such system for purifying the waste water from their plant.

4th. When the owners have decided upon some general plan, such plan should be submitted to the State Board of Health for criticism and approval.

July 13, 1906 a copy of this report was sent to the mayor of Brookside also to the proprietors of the slaughter house.

It was stated that there seemed to be no doubt that the nuisance might be removed in the manner indicated by the engineer, and that the Board would be willing to assist them in making plans for carrying out this improvement and would have an engineer visit them for that purpose, if they were willing to carry out the recommendation.



## REPORT ON THE SANITARY CONDITIONS OF BUCKEYE LAKE AND SURROUNDINGS.

On August 21, 1906 the chief engineer visited Buckeye Lake in company with Mr. George H. Watkins, president of the state board of public works, Mr. E. E. Booten, an engineer of the board of public works, representatives of boards of trustees of Walnut township, Fairfield county and Union township, Licking county, and a delegation of lessees of state land.

The following report was made:

Buckeye Lake or Licking Reservoir is situated at the junction of Licking, Fairfield and Perry counties. Its construction was commenced in 1828 and completed in 1832. In 1836 it was enlarged by 500 acres at the western extremity. The total area of the reservoir, including adjacent land owned by the state, is about 4200 acres. The reservoir acts as a feeder of the Ohio Canal from Newark to Little Walnut Creek just south of Lockville, a distance of thirty-one miles. It also supplies the deficiency between Little Walnut Creek and Lockbourne. The area of the watershed tributary to the reservoir is about ninety square miles. Since the canal system has fallen into disuse it has been used primarily as a pleasure lake and summer resort, for which the beauty of the locality makes it especially adapted. By an act of the General Assembly, passed May 21, 1894, it was reserved for a public park to be known by the name of "Buckeye Lake." The interurban cars connecting with Columbus, Newark and Zanesville have given a great impetus to the use of the lake for pleasure purposes.

Owing to the rapidly increasing popularity of the lake the state board of public works proposes to introduce such improvements from time to time as will render it more attractive. Among the many problems requiring attention are the reinforcement of embankments, the draining of mosquito breeding swamps, the prevention of growths of plants in the lake which on decaying emit disagreeable odors, and the removal of stumps and other obstructions to navigation. The board of public works has decided to devote its attention first to those conditions that most directly influence the healthfulness of the locality and to the safety of the reservoir embankments.

Along the northwest shore of the lake is a long embankment having an average height of about 10 feet, a width on top of 6 feet and sides with a slope of  $1\frac{1}{2}$  on 1. In constructing this bank material was borrowed from land lying at its foot leaving a trough parallel to the embankment in which pools of water stand stagnant during the whole summer. This stagnant water forms a breeding place for great numbers of mosquitoes. It is now proposed to drain these low places by means of field tile which will discharge into the south fork of Licking River. This drain is to be used for drainage only and no sewage or domestic wastes will be per-

mitted to be discharged into it. The embankment and the narrow strip of state land lying back of it has been divided into lots which have been leased to persons desiring to build summer cottages.

It was at first proposed to construct a sanitary sewer to provide for these cottages and having an outlet into the south branch of Licking River, but after a consideration of the expense involved and nuisance that would probably be occasioned in the branch during low water it was decided to abandon this scheme and cause privies to be installed—these privies to be properly constructed and maintained in a sanitary condition. The following is a suggestion for rules and regulations governing the construction of and proper care of the privies.

1. All privies shall be provided with galvanized iron water-tight receptacles in which all fecal matter shall be caught.

2. The receptacles in which fecal matter is contained shall be entirely enclosed in suitable compartments to prevent the admission of flies, but so constructed as to be readily accessible for inspection or removal of receptacles.

All seats shall be provided with hinged covers.

3. A supply of powdered slaked lime shall be always accessible and the fecal matter sprinkled with same after each use of the privy.

As soon as full, receptacle must be removed at least one-fourth of a mile from any state land, emptied and thoroughly cleaned.

At the time of examination great quantities of water weeds were floating about the lake in the eastern portion. It is said that these weeds on decaying made the shores almost uninhabitable on account of the stench. In order to learn if these growths could be effectively exterminated by means of copper sulphate a specimen of the weeds causing the most trouble was sent to Mr. Karl F. Kellerman, physiologist in charge of soil bacteriology and water purification investigations under the United States Department of Agriculture, for examination. The result of this examination is embodied in the following extract from his letter.

"Unfortunately, the principal weed causing the trouble is a very resistant one and it would be impossible to eradicate it without a more or less wholesale destruction of the catfish and probably the sunfish, although the bass would not be seriously inconvenienced. In addition to the probable injury to the fish, it is necessary to emphasize the point that copper treatment of weeds of this sort, which are deeply rooted in the mud, can produce but temporary relief. Under the circumstances I doubt if it would be wise to attempt the copper treatment at Buckeye Lake."

From this letter it would appear that at the present time chemical treatment for the removal of weeds would not be feasible.

September 25, 1906, a copy of this report was sent to the president of the state board of public works with the statement that the best plan for caring for the present sewage of Buckeye Lake Park and cottages

appeared to be by means of private vaults carefully constructed and maintained according to rules set forth in report; that apparently the use of copper sulphate would be inefficient in exterminating the weeds which grow in certain portions of the lake, and that the stagnant water which forms breeding places for mosquitoes should be drained as a means of doing away with that nuisance.

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## REPORT OF AN INVESTIGATION OF A NUISANCE CAUSED BY A CANNING FACTORY AT CELINA.

On September 24th, 1906, complaint was made by Mr. T. J. Godfrey, a resident and property holder of Celina, in regard to a canning factory which discharged waste material into a ditch flowing through his property. The chief engineer visited Celina on September 27th, made the necessary inspection, and submitted the following report:

The canning factory complained of is owned and operated by Mr. Ira E. Crampton, and is located in the westerly portion of the corporation immediately west of the Cincinnati Northern Railroad tracks, and about 1,000 feet north of the railroad station.

The factory is usually operated from the early part of June to the latter part of October. Peas are canned during the first part of the season and corn and tomatoes later, while the month of October is usually occupied in making tomato catchup from the waste material from canning the tomatoes.

At the time of inspection tomatoes were being canned at the rate of 500 or more bushels per day. About 20,000 bushels are canned during the season. The tomatoes on arriving at the plant are placed in a wooden steam box about one foot wide, six inches high and twelve or fifteen feet long, where they are steamed after being sprinkled with cold water. This treatment removes the dirt from the outside of the tomatoes and takes up a greater or less quantity of seeds outside from bruises in the tomatoes. This waste, amounting to possibly 3,000 gallons per day of ten hours, is discharged into a ditch which is dry except for the above mentioned waste. This ditch extends in a southerly direction from the canning factory, parallel with the railroad, and ultimately discharges into Beaver Creek. The waste as discharged at the factory is not offensive, but a few hundred feet below the factory, on standing in the ditch, it readily putrefies and causes a very offensive odor, besides becoming black and foul looking. A sample of the waste was collected and the analysis shows that it contains a much greater amount of organic matter than sewage, and it is readily perceived why the nuisance is caused.

On August 16th, 1906, the assistant engineer inspected the sewerage conditions at Celina and found that the village was proceeding to con-

struct sewers and discharge them into the nearest water course, in spite of the fact that such a system had been disapproved by the State Board of Health. One of these sewers discharges into the same ditch which is now being polluted by the canning factory. The sewer does not at present, apparently, cause pollution, but it will undoubtedly do so in the future when it is used to a greater extent. On August 30th, the following letter was sent to the board of trustees of public affairs:

"One of our assistant engineers recently made an inspection of the sewerage system of Celina with especial reference to the necessity of purifying the sewage. I enclose a copy of his report herewith.

As you are no doubt aware, this Board approved general plans for sewerage and sewage purification for Celina in 1901. It appears that these plans were abandoned and that storm sewers involving a new outlet were constructed and that these sewers receive considerable domestic wastes and are discharged into an open ditch without purification. This was in violation of the law, as the plans of these sewers should have been approved by the State Board of Health.

Your Board, which has authority to regulate the use of all sewers, should at once stop the discharge of domestic sewage into these newly constructed storm sewers.

We hope that your village will take up, at the earliest possible time, the matter of constructing proper sanitary sewers with a sewage purification plant, either in accordance with plans already approved by this Board or other plans, if considered desirable, which should also be submitted to the State Board of Health for approval."

#### CONCLUSION.

1. The discharge of waste from the canning factory of Mr. Ira E. Crampton into a ditch parallel with the Cincinnati Northern Railroad, in the westerly part of Celina, causes a distinct nuisance, and this waste should be otherwise disposed of or should be purified before it is discharged into this ditch.

2. The waste could be disposed of, at considerable expense, by evaporating it in a triple or quadruple effect evaporator, or it could probably be successfully treated by sedimentation in tanks, followed by treatment on filters of proper material.

3. The most satisfactory and economical method of disposing of the waste can only be determined after careful investigation, and the owner of the factory should employ an expert, experienced in the disposal of such waste, to devise some plan for the case in question. This plan should then be submitted to the State Board of Health for approval before being put into effect.

4. The village of Celina is now building sewers which discharge into the same ditch polluted by the canning factory. At present this pollution of the sewers is not of serious consequence, but in time the pollution from this source will undoubtedly be very serious. It is important that the village take steps toward purifying its sewage as well as that the canning factory provide for purifying its waste.



October 11, 1906, a copy of this report was sent to the health officer of Celina, and he was advised that there seems to be no doubt of the existence of a nuisance nor of the authority of the board of health to abate it by requiring that the waste matters from the factory, the cause of the nuisance, be properly purified, or that the factory cease operating.

A copy of the report was also sent to Mr. Godfrey, the complainant, with the statement that should the local authorities be unwilling to act in the matter, the statutes provide a remedy through the county commissioners; Section 6920a R. S., providing for the appointment of an inspector of nuisances to especially deal with nuisances arising from offensive trades; that when so appointed this inspector is fully authorized to take the necessary legal steps for the abatement of nuisances, and the prosecuting attorney becomes his legal adviser, and is to be paid for his services — an important point.

He was further advised that the State Board of Health had not been given authority to deal with such questions except in an advisory capacity.

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## REPORT OF AN INVESTIGATION OF PROPOSED SCHOOL HOUSE SITES FOR COLLINWOOD.

On January 29, 1906, the assistant engineer visited Collinwood for the purpose of investigating the relative merits of three sites proposed for a school house for that village. The investigation was requested by Dr. P. E. Kerlin, a member of the village council, and Dr. C. W. McClenahan, health officer. The report of the assistant engineer upon this investigation is as follows:

### GENERAL CONSIDERATIONS.

The village has at present a population of about 5,000 and is growing with considerable rapidity. The tracks of the Lake Shore and Michigan Southern Railroad divide the village into two sections, known respectively as the North and South ends. It is stated that a somewhat smaller portion of the population lives in the North End and these are very largely of the laboring class, being employed in the railroad shops and factories. The South End is given up almost entirely to residences of the better sort, though the main business section of the village is just south of the railroad tracks on Collamer Street.

It is estimated that there are now 850 school children including those in the high school, and there is regular accommodation for somewhat over half that number.

At present there are three schools in use the oldest being an old brick building on Collamer Street near the railroad. This building is



old-fashioned and poorly constructed and is overcrowded with children of the lower grades.

The Lakeview school in the North End is a new building with four rooms, and is so constructed that another story of four more rooms may be added. This building is also overcrowded.

The high school on Clark Street is a fairly modern building with eight school rooms, four of which are used for high school purposes and the others for graded school purposes.

In addition to the above, two stories and the basement of the high school are now being used as class rooms for the younger children. The lighting and heating of these rooms is undoubtedly very bad.

The proposed new school is to have fourteen rooms, each to accommodate sixty or more pupils. Four of the rooms are to be used for high school purposes and the others for the graded schools. The appropriation is also intended to cover an addition to the Lakeview school of four more rooms.

There are three sites actively considered for the proposed new school, namely, the Ford site, the Gates site and the St. Clair site, each of which is discussed below as follows:

#### DISCUSSION OF PROPOSED SITES.

The Ford site is located between Crosby and School streets just back of the old school building on Collamer Street; 162 feet wide between Crosby and School streets and 525 feet long, giving an area of 85,000 square feet, or an area of 101 square feet per pupil, cost \$23,410. This site is in a low part of the village, the ground is generally damp and the groundwater level is said to be but 9 feet below the surface. The soil is of a dark, loamy nature, which is said to be underlaid with a thin stratum of quicksand at a depth of eight to ten feet, and this in turn rests on a bed of shale. About  $\frac{7}{8}$  of the lot has been filled in to a depth of several feet with a good gravelly earth. Along the south side and west end of the lot is an open ditch about 4 feet deep which receives the surface washings and more or less sink drainage from the surrounding neighborhood. No guards are placed about the ditch to prevent children from getting into it, and, in fact, at the time of inspection a number of children were playing in and about the ditch. The water in the ditch stands stagnant and has a repulsive appearance. It would be a simple matter, however, to fill in the ditch and carry the water through a drain pipe. There are some eight or ten large trees on the site which if trimmed and put in condition would add greatly to its attractiveness.

Crosby and School streets are unpared and in bad condition.

South of this site are residences of a neat and substantial appearance. On the north side the residences are of the poorer sort and many are in a more or less dilapidated condition. On the east there are no

houses at all. On the west is Collamer Street which is the principal business street. Most of the stores are unattractive in appearance, and there are eight or more saloons within 500 feet of the school site.

About 1,000 feet distant and to the northwest, is the railroad round-house, from which rises a great quantity of soft coal smoke. When the wind is from the north or northwest much of this smoke undoubtedly blows over the school site, but on the day of examination the wind was from the southeast, causing all the smoke to be carried in another direction.

The Gates site is located on the corner of East St. Clair Street and East Collamer Street, the locality being known as Five Points. While somewhat farther away from the center of population (about  $1/2$  mile from the Ford site) it is accessible by two car lines from the north and west. The lot is 254 feet on St. Clair Street and 502 feet on East Collamer Street, giving an area of 127,500 square feet or 152 feet per pupil. Cost \$12,000. At Five Points there are several stores and two small saloons; otherwise the neighborhood to the northeast and northwest is given up to residences of the better sort. South of the site are undeveloped building lots, only a few houses having been built. The nearby streets are, or soon will be, paved.

This site is practically on the summit of a hill, the highest land in the village and perhaps 50 to 60 feet above the lowland near the railroad. The soil is clayey and would undoubtedly give a good and dry basement.

This site, but for its being on the edge of the populated district instead of near its center, would be an ideal place for a school building.

The St. Clair site is located on St. Clair Street, three blocks northeast of the Gates site. Frontage on St. Clair Street, 210 feet and 387 feet deep, giving an area of 81,300 square feet, or 97 square feet per pupil. Cost \$12,000. This site is on ground very nearly as high as the Gates property and resembles it in being well drained and affording a good foundation for building. The neighborhood is considered one of the best residence portions of the village. The lots to the east and southeast have in only a few cases been built up. St. Clair Street is well paved at this point. Like the Gates property this site is well suited for a school, but is on the edge of the populated portion of the village and has the further disadvantage of being several blocks from the car lines.

The Ford site has the advantage of being very centrally located, though it has the disadvantage of being on somewhat damp and poorly drained ground, in a neighborhood not pleasing to the eye and with suitable environment for school children. The Gates and St. Clair sites are in every way suitable for school buildings but are not near the center of population. It will be seen also that these last mentioned sites have the advantage of lower cost.

## REMARKS.

From information gathered at the time of examination there appears to exist considerable jealousy between the North End and South End of the village. The North End is strongly in favor of the Ford site for the new school, owing to its nearness to that portion of the village. The South End, on the other hand, prefers the Gates and St. Clair sites owing to their better location for school purposes and urges the unimportance of the half mile greater distance from the North End. -

A copy of this report was sent to the health officer February 13th, 1906, and the opinion expressed that the so-called Gates and St. Clair sites were preferable from a sanitary standpoint, being well removed from smoke and dirt of the railroad car shops, in a desirable neighborhood, and the soil conditions favorable for obtaining a dry foundation on account of good drainage.

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REPORT ON ALLEGED NUISANCE AT DELTA.

On August 16, 1906, there was received from Mr. J. J. McDermott and eight others, residents of Delta, a petition asking the State Board of Health to investigate a nuisance caused by the Lake Shore & Michigan Southern Railway Company's reservoir. The railway company was written to in regard to abating the nuisance and in reply forwarded a statement signed by Mr. S. P. Bishop, ex-health officer, and by eighteen other residents of Delta, stating that the complaint was unfounded. On October 15, 1906, the chief engineer visited Delta, made an investigation of the alleged nuisance and submitted the following report:

A small water-course, known as Bad Creek, flows through the westerly and southerly portions of Delta and is impounded by means of a small dam at a point immediately south of the Lake Shore & Michigan Southern Railway Company and just west of John Street. This dam forms a reservoir of ample capacity to furnish water for railroad purposes and it is also used as a source of ice supply; the ice, it is said, being used for cooling purposes only. On account of this dam the water of the stream is backed up for perhaps half a mile, extending close to the built-up portion of the village. It is stated by the complainants that this back-water becomes stagnant and foul at times and gives off objectionable odors. At the time of inspection, however, there was a very considerable flow in Bad Creek all through the town, and at no point was there evidence of a nuisance occasioned by stagnant water.

Another feature complained of is that the dam holds the water back from the natural water-course below the town, thus rendering it unhealthy. It is probable that at times of dry weather the water is held back, but there is at present no serious source of pollution below the dam, and

for this reason it is not probable that the creek bed is objectionable, even though there be little or no flow of water in it. The complainants may have just cause for complaint in that their water supply for stock watering purposes is at times cut off, but this feature would seem to be a question of law and not one of health.

#### CONCLUSIONS.

1. At the time of inspection there could be discovered no objectionable conditions caused by back-water from the Lake Shore & Michigan Southern Railway Company's reservoir.

2. It is possible that at times of continued dry weather the stagnant water may afford chance for objectionable growths.

3. The damage, if any, of taking away the natural water supply, for stock watering purposes, of certain farmers below town, is a matter which the farmers may settle in the courts.

4. It might be desirable to make further investigation at a time of extreme drouth.

October 22, 1906, a copy of this report was sent to the complainants and also to the railway company, and they were notified that if they believed conditions to be worse at times of extreme drought than they were on October 15th, and they would notify the Board when such conditions occurred, another investigation would be made.

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#### REPORT ON A NUISANCE CAUSED BY THE POLLUTION OF JENNING CREEK AND BY A GARBAGE DUMP AT DELPHOS.

A letter was received from Dr. W. J. Francis, health officer of Jennings Township, on June 9th, 1906, complaining of objectionable conditions attributed to a garbage dump, formerly used by the village of Delphos: and also of the pollution of Jennings Creek by the sewage from the village. On July 6th, 1906, the assistant engineer made an inspection of the conditions complained of, and submitted the following report:

Delphos is located at the intersection of the county lines of Van Wert, Putnam and Allen counties. The village lies entirely in Van Wert and Allen counties, half of the area within the corporation limits being in each. The surrounding country is quite flat, with a very slight fall towards the northwest. The population at the present is estimated at about 5,000. The city is primarily a farming center, but possesses one strawboard mill. In July, 1904, the Board gave the following approval to the use of storm water sewers as a combined system:



"First. The construction and use of the combined sewers with the understanding that all connections for domestic sewage be removed from them as soon as it is found that the discharge of such sewage through the sewers causes a nuisance either on account of odors arising through catch basins in the streets, or on account of pollution of the stream caused by the impracticability of purifying such sewage when combined with storm water;

"Second. The discharge of the dry weather sewage into Jennings Creek near the northerly limits of the corporation, after such sewage has first been passed through a sedimentation tank holding 15,000 gallons, until such time as the State Board of Health deems thorough purification necessary; and,

"Third. The storm water system and outlet into Jennings Creek for the Third Ward District."

The conditions of this approval seem to have been followed out but partially, since strawboard wastes are discharged through the Third Ward storm sewers. The conditions complained of in Jennings Creek are probably not due so much to the sewage discharged therein as to the large amount of strawboard wastes which find their way to the stream through this sewer.

An inspection of the outlet of the storm sewer used for domestic purposes showed that the sewage after passing through the sedimentation tank was fairly free from suspended matter. The sewage, however, was sufficient in quantity to cause considerable discoloration of the water in the stream. It was also observed that for a distance of five or six hundred feet below the outlet a rather thick deposit of black, putrescible matter was formed in the bed of the stream, and that pieces of this break loose and float on the surface of the water. No distinctly disagreeable odors, however, were noticeable.

About half a mile down stream from this outlet is the outlet of the Third Ward District storm water sewer, (discharging strawboard wastes as above described). Just above this outlet no evidences of the domestic sewage could be seen, excepting a light deposit of black sludge in the stream bed. The water was clear and contained numerous, small fish. Below the outlet the discharge of strawboard wastes discolored the whole stream within a few hundred feet down stream, and as this waste is very stable in its composition, it undoubtedly reaches Fort Jennings, the next town below, without having been to any extent purified. It is quite likely that within this distance the waste may have undergone a slight amount of putrefaction, which renders it more objectionable to sight and smell than the fresh waste near the outlet.

*Garbage and Refuse Dump.* The garbage dump in the northern part of the city which was complained of was visited and carefully inspected. The dump itself was perhaps 100 feet long and 25 feet wide, and was very unsightly in appearance, though this could not be held to be a great objection, as there are no dwelling houses in sight of it. The nearest highway is the canal tow path, which is immediately alongside, but is now scarcely ever used. No evidence could be found of putrefying



matter on the surface of the dump, though this may be due to the fact that the dump had not been in use for several weeks, and such matter had disappeared. The only odor noticeable about the dump was a slight musty odor characteristic of mixed refuse.

Across the canal and within the boundary line of Jennings Township, Putnam County, are two slaughter houses. The slaughter house nearest the dump maintains a large boneyard and discharges its liquid waste into a small sized swamp adjoining the creek. As a result, a very bad odor was noticeable in the vicinity, and it is quite possible that the odors complained of as coming from the dump come instead from this slaughter house. The other slaughter house is several hundred yards distant in a down-stream direction, and is in about the same condition as the first, though liquid wastes reach the stream more directly. Odors in the neighborhood of the latter establishment were not very noticeable.

It was also complained that rats were propagated in large numbers on the refuse dump, and a number were seen at the time of inspection, but equally large numbers are evidently in the neighborhood of the slaughter house also.

*Summary.* In summarizing it may be said that if the strawboard wastes could be kept from Jennings Creek, the nuisance in the creek at Fort Jennings stated to be due to an improper purification of the sewage would be eliminated.

In regard to the dumping ground, it would appear that while this is possibly a source of nuisance to the few residents in the neighborhood, yet fully as bad if not worse conditions are found in connection with the slaughter houses.

August 3, 1906, a copy of this report was sent to the board of trustees of public affairs of Delphos, and their attention called to the fact that the pollution of Jennings Creek appeared to be principally due to the discharge of waste from a strawboard works through one of their storm water sewers; that their board had authority to prohibit this, and thereby escape responsibility for the pollution of the creek. They were also advised that it would probably be necessary for them to build a proper purification plant within the next two or three years to supplement the present tank.

The report was sent to the health officer of Washington Township, with a copy of the letter sent to the board of trustees of public affairs of Delphos.

A copy of the report was also sent to the health officer of Jennings Township and attention called to the fact that it appeared that the pollution of the creek was in very large part due to the refuse from the strawboard works discharging into it through a storm water sewer of the village of Delphos; that the board of trustees of public affairs could prevent the use of this sewer for that purpose, and people living along

the creek, or the township board of health could bring action against the strawboard works for the pollution of the stream, as had been done in several instances in the state.

He was advised that the garbage dump did not seem to be so much the cause for complaint at the time of inspection as were two slaughter houses in the township; which were the cause of a nuisance and the same should be abated by his board of health.

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### REPORT ON A NUISANCE AT DORSET, ASHTABULA COUNTY, CAUSED BY THE UNSANITARY CONDITION OF A CHEESE FACTORY.

In April, 1906, complaint was made to the Board of a nuisance caused by the discharge of waste from a cheese factory at Dorset, Ash-tabula County. The attention of the local health authorities was called to the matter and they were asked to investigate the complaint and take such steps as were necessary to abate any nuisance found.

They replied, asking the State Board of Health to send a representative there to assist them. Accordingly, on June 29, 1906, the member of the Board from that district visited Dorset and gave the surroundings of the cheese factory a close inspection.

The following report was made:

The factory is situated on a little rise of ground about 20 rods from a water course, which has no running water at this time of year. It is an old wooden building with the sills on the ground and stagnant water and filth on all sides. There is also water underneath the engine room close to the vats and old rotten boards lying in the water. A whey tank at one end of the building, about 8 feet deep, is covered with refuse and products of fermentation, and it is alleged, has not been cleaned for months. The excess of whey has been discharged into an open ditch that finds an outlet into the above mentioned dry creek. The ground in many places showed saturation, as lately a narrow ditch has been cut which collected the effluent and conveyed it more directly into this creek bed. It is along this creek bed that the complaints have come.

In the immediate vicinity are fifteen to twenty houses, a school house and church. The school house has an attendance of sixty to seventy-five pupils. The creek bed goes through the edge of a wood lot and pasture and every water hole was covered with a slime, in places a fourth of an inch thick, with a horrible odor. On the day of inspection the wind was in the north and the odor in the neighborhood was not as bad as in the still, muggy days and nights, when it is claimed to be most unbearable, though on this day it was bad enough to drive one

out. It was stated that many times the windows of the school house cannot be raised on account of the stench, and one of the physicians stated that this odor could be detected for a mile from the place.

The factory has been sued for damages for injury to stock (cows) and has twice lost.

The above statements are a mild description. About 16,000 pounds of milk comes to the factory daily, from which thirty to forty cheese are made each day. On the whole it is the most unsanitary place ever visited by the writer, where edibles are manufactured.

#### RECOMMENDATIONS.

The building should be raised and thoroughly drained; cement floors wherever moisture is used should be laid; a tile conduit should be constructed to a new cement whey tank, and the whey should be removed every day by customers. The tank should be cleaned thoroughly at least once a week and no overflow should be allowed.

Cheese from such surroundings should be subject to inspection after the manner of the Chicago slaughter houses.

The writer was courteously shown around by several of the inhabitants, but the superintendent in charge seemed out of humor and said the whole thing was spite work, notwithstanding the surroundings, the condition of which would seem to contradict this.

July 6, 1906, a copy of this report was sent to board of health of Dorset Township, Ashtabula County, and the hope expressed that the matter would receive attention.

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#### REPORT ON THE NECESSITY FOR SEWERAGE AT GALION.

On July 21st, 1906, Mr. W. J. Geer, mayor of Galion, requested the State Board of Health to investigate the sanitary conditions of Galion with respect to the necessity for sewerage. On August 1st, 1906, the chief engineer visited Galion and made an inspection.

The following report was submitted:

Galion is a city of nearly 10,000 population, located in Crawford County upon the upper portion of the Olentangy River, locally known as Whetstone Creek.

Some twenty or thirty years ago a general plan for a sewerage system was drawn up by the late Colonel George L. Waring, Jr., but this plan was carried out only to a very slight extent, there being but one district sewered at the present time. The city is, therefore, very poorly provided with drainage, having not over three miles of sewers; whereas, for a city of its size, ten miles would be no more than adequate. Of the

present sewers about three-fourths of a mile discharge into Pickle Run and the remainder into Whetstone Creek direct.

Pickle Run is a small, intermittent stream which originates in the southerly portion of the corporation near the junction of the Erie and Big Four railroad tracks. During most of the time its flow consists of the washings from a railroad round house and of house sewage. The stream between its point of beginning and its junction with Whetstone Creek passes through the most thickly settled portion of the city, beneath and adjacent to buildings and under several of the principal streets for a distance of 3,000 feet. The stream is uncovered, except for a few short sections where it passes under streets or buildings. Connected to the above mentioned three-fourths of a mile of sewers and to numerous house drains discharging directly into the stream are over one hundred water-closets and numerous urinals, wash stands and bath rooms. Pickle Run, therefore, constantly receives the sewage from fully 1,000 persons. In addition, rubbish and filth and waste water of various kinds are thrown into it. The conditions at the time of inspection, although a few days after a very heavy rain and therefore unusually favorable, were still such as to make the stream a distinct menace to health and a disgrace to the city. The stream is worse than an open sewer.

Whetstone Creek passes through the northerly and westerly edges of the corporation. Its flow is held back during some of the time by reservoirs, which impound the water above town for railroad purposes. Practically no flow is left, therefore, to dilute the sewage. Besides receiving domestic drainage from a storm sewer in the northeasterly portion of the town, the stream receives the drainage from a main sewer of one sewer district. This district is the only one in town which is provided with sewers. The discharge at this outlet has the effect of rendering Whetstone Creek very offensive during most of the time, as borne out by the present and previous inspections.

The typhoid fever rate at Galion during the past ten years has been much greater than it should be for a city of the same size with proper sanitary conditions; thus much sickness has been unnecessarily created. Even at the time of inspection, it was learned that there were four or five cases of typhoid fever among persons living near Pickle Run.

Flies and other insects are considered to be a common means of transmitting disease-infected filth; and the close proximity of many houses to Pickle Run would indicate that mode of disease transmission has existed at Galion to a large extent.

#### PAST INVESTIGATIONS BY THE STATE BOARD OF HEALTH.

In 1895 the secretary of the State Board of Health made an investigation of the pollution of Pickle Run and found that the sewage from some eight hundred people was being discharged into it, that a most



offensive nuisance was then being created and the health of a large number of people was being endangered. It was then suggested that the conditions might be improved by one of three ways, as follows:

1st. By converting the run into a covered sewer. But as this plan would only transfer the nuisance from one part of the city to another, it was not recommended.

2nd. By prohibiting the drainage from all water closets, privy vaults and other filthy matters into the run. The local board of health was authorized by law to carry out this plan, but as it would work a great hardship on many people, it was not advised as the most practicable measure; but only as a last resort.

3rd. By providing proper sewerage and sewage disposal, as Whetstone Creek was even then entirely too small to properly dilute the sewage of Galion.

In 1897 the board of sewerage commissioners of Galion presented plans to the State Board of Health, showing a proposed line of sewers and outlet. These plans were referred back to the commissioners with the request that a report be prepared showing plans for purifying the sewage. As the cost of such purification was considered to be somewhat great, by the commissioners, nothing more was ever done with this project.

In 1902, Mr. John P. Force, consulting engineer, submitted plans to the State Board of Health showing in a general way a method for providing adequate sewerage and sewage disposal. These plans were approved.

#### CONCLUSIONS.

1. From the present and also from past investigations made by the State Board of Health during the last ten years, it has been found that the sanitary condition of Galion, as regards the disposal of its sewage and other waste matters, is most disgraceful, and is a constant source of danger to the health of the inhabitants.

2. Probably a large amount of sickness and certainly much discomfort has been caused in Galion during the past ten years, which could easily have been prevented at moderate expense.

3. The city council should at once take steps toward procuring detailed plans and specifications for a sewerage system and a sewage disposal plant, satisfactory to the State Board of Health, and then take steps toward raising necessary funds to pay for their installation.

August 8, 1906, a copy of this report was sent to the mayor of Galion and he was advised that should the authorities still be unwilling to act probably the question could not be forced unless the people living along the stream should join in injunction proceedings.

It was suggested that the publication of the report might have a good effect.



## REPORT ON THE POLLUTION OF GREENVILLE CREEK BY SEWAGE FROM GREENVILLE.

On December 29, 1905, the assistant engineer of the Board visited Greenville and made a general examination of the sewerage system and sewage outlets and the following report was made:

The city of Greenville is in the central part of Darke County and has a population of approximately 6,000. The general character of the neighboring country is flat to undulating. The city is on Greenville Creek, a tributary of Stillwater River, which in turn empties into the Great Miami.

Greenville Creek has a watershed above Greenville of about 115 square miles, with a minimum run-off of about 0.02 of a cubic foot per second per square mile. This would give a minimum flow in the creek at Greenville of about 2.3 cubic feet per second. At the time of examination the water in the creek was fairly clear and was said to be at medium stage. A rough estimate would indicate that there was a flow of about 15 cubic feet per second.

The first sewers were for storm water only, but occasionally these were tapped without the sanction of the authorities and used for domestic purposes. In 1901 a sanitary sewerage system was installed which carries domestic sewage only. This system was designed by J. P. Force, consulting engineer, of Columbus, Ohio.

The general plan of the sanitary sewers is shown on a map which will be furnished in the Annual Report of 1900, page 387. Outlets of storm water sewers are also shown. All sewers are made of vitrified sewer pipe with cemented joints, with the exception of the main sanitary sewer outfall, which is made of bell and spigot cast iron pipe. No sewers, so far as is known, are underdrained.

All sanitary sewers are flushed by means of flush tanks. Sixty flush tanks are now in use, each discharging 500 gallons of water per day. The sewerage system now in use seems ample to provide for all immediate needs of the city.

No measurements of the flow of either domestic sewage or storm water have been made and it is not possible to obtain a reasonable estimate of these quantities. There are probably 300 to 400 houses, representing about 1,000 persons, and one creamery tributary to the sewers. Some attempt has been made to prevent the use of storm water sewers for sanitary purposes, but it is believed that there remain some such connections.

The sewer outlets are described as follows:

1. Four-inch tile storm water sewer discharging a small amount of clear water.
2. Whitley storm water sewer, 8-inch vitrified pipe, discharging below surface of water; apparently no effect on appearance of stream.

3. Broadway storm sewer, 24-inch vitrified pipe, discharging small flow of muddy water without noticeable effect on stream.
4. Court house storm water sewer; discharging below surface of water and could not be seen; no effect on appearance of stream.
5. Fifth Street storm water sewer, discharging below surface of water; no noticeable effect on stream.
6. Sanitary sewers, 15-inch cast iron bell and spigot pipe, discharging below surface of water. Effect on stream very marked; considerable deposit on bottom and bank near outlet but no marked odor could be noticed in the neighborhood of the outlet, due undoubtedly to cold weather. Several hundred feet below the outlet at point where sewage became thoroughly mixed with water in stream there existed evidences of sewage pollution, but they were not marked.
7. Eight-inch tile drain from slaughter house. Quantities of blood being discharged that could be traced in the stream several hundred feet below outlet.
8. Small wooden drain from slaughter house, not discharging at time of examination but is used daily for several hours.

#### ACTIONS OF STATE BOARD OF HEALTH.

On October 30, 1895, the Board approved a sewerage system and sewage disposal plant, as called for in plans and specifications drawn up by J. P. Force, C. E., then of Fostoria. On January 20, 1897, a modification of these plans was approved. On January 24, 1900, the Board approved the construction of a sewerage system without the use of purification works, "subject to the condition that within a period not to exceed five years from date, arrangements should be made for the purification of the sewage in a manner to be satisfactory to the State Board of Health."

In July, 1900, a petition, signed by 246 persons residing near or having property on the stream below Greenville, was received, requesting the State Board of Health to require the purification of Greenville sewage. After a consideration of the matter it was decided by the Board not to rescind its former action.

Subsequent to the time this report was submitted, complaints were received by the State Board of Health of the nuisance caused by the discharge of a sanitary sewer outfall. As the examination described in the above report was made during cold weather and at a time when there was considerable flow in the creek no very marked nuisance was noted and another examination to be made during warmer weather and at a lower stage of the water, was deemed advisable. Accordingly the assistant engineer made a second visit to Greenville, April 15, 1906, and submitted the following:

On this date the water in Greenville Creek was low but not at its lowest stage. There was considerable current and the water above the

outlet was quite clear. Below the outlet evidences of sewage pollution were plainly noticeable for a considerable distance down stream; the stream bed was heavily coated with a black muck and the water had a somewhat darkish appearance in the more quiet and deeper places. No disagreeable odors, however, could be noticed at any point except in the immediate vicinity of the outlet. Owing to the fact that the conditions in the stream were not at their worst, the examination was not continued more than several thousand feet below the outlet. It would be advisable to make another inspection after a long dry spell in the middle of summer.

In accordance with the recommendation made in this report the assistant engineer made a third visit to Greenville on August 14, 1906, during which he made an extended examination of the creek below the sanitary sewer outlet and the following report was made:

On the date of this examination the creek was at medium low stage and there had been a preceding period of rather warm weather. The creek water above the sewer outlet was slightly turbid, but showed no visual evidences of sewage pollution. Immediately below the outlet the water was very highly polluted and sewage matter stood in pools near the banks emitting offensive odors. On probing the bed of the stream with a stick it was found to be lined with a heavy accumulation of black sewage sludge. The conditions here are undoubtedly very bad, and as indicated by complaints received by the State Board of Health, cause the value of real estate in the neighborhood to be greatly depreciated. The worst conditions were noted in the immediate neighborhood of the outlet, but the creek continues to remain quite offensive for six or seven hundred feet down stream. At a point about half a mile down stream no offensive odors could be noticed, nor did the appearance of the water indicate sewage pollution. The probing of the bed of the stream, however, showed the presence of a considerable deposit of sewage sludge. Conditions in this neighborhood are said to be worse at times of extreme low water. At this point is a slaughter house which kills in the neighborhood of fifty animals per week, permitting all blood and floor washings to run into the creek. At the time of inspection no noticeable effect of the discharge of wastes from this slaughter house could be observed in the stream, though immediately around the slaughter house drain there was a somewhat greater accumulation of black sludge.

At a point about two miles below the outlet the stream was examined and a sample of water taken. It is said by residents near this point that at times bad odors are noticed in the neighborhood of the creek, which odors are attributed not so much to the sewage as to the presence of putrefying entrails from the slaughter houses which are caught on the banks and by fallen trees. At the time of inspection no entrails could be found, nor could any odor be noticed in the neighborhood of the stream. At certain places, however, where the water is generally quiet, slight deposits of sewage sludge were found.

The analysis of the sample taken at this point indicates by the high oxygen consumed, large quantities of albuminoid ammonia, free ammonia and nitrites, the absence of nitrates, the large total number of bacteria and the presence of intestinal bacteria, a water that is highly polluted and unfit for stock watering purposes; though the amount of decomposing organic matter is not sufficient to cause a nuisance. (For analyses see Laboratory Report on Water Supplies).

Another examination of the stream was made at a point about four miles below the sewer outlet and a sample was collected here also. There were no evidences of a sewage pollution either in the appearance of the water or in deposits of sewage sludge in the bed or the stream. The analysis indicates, however, that the water is but slightly improved over that at the point two miles below the outlet.

The examination would seem to indicate that the discharge of sewage at the present rate into Greenville Creek causes a very serious nuisance near and within about a thousand feet below the outlet; this nuisance occurring even when the water is but moderately low. Half a mile down stream from the outlet it cannot be said that a direct nuisance is caused by sewage pollution alone, though the water is undoubtedly rendered unfit for cattle.

All of the blame for the bad condition of Greenville Creek cannot be placed upon the sewage discharged from Greenville, since three slaughter houses (two above the outlet and one below) throw entrails into the stream which lodge at various points along its course and there undergo decomposition. These slaughter houses are not permitted to dispose of entrails in this manner and butchers using them will not admit that any are thrown into the stream, but the evidence in the case is to the contrary.

In view of the rights of property owners holding land in the vicinity of the outlet of the sewer and who would gladly improve their land were it not for the nuisance occasioned by the sewer outlet, it would seem advisable for the city to purify its sewage. Furthermore, the removal of raw sewage from the stream would render it more suitable for stock watering. In addition to the purifying of the sewage, no slaughter house wastes should be permitted to enter the stream. Probably the most available way for disposing of these wastes would be to discharge them into the city sewers and purify them along with the domestic sewage.

Copies of these reports were sent to the board of public service of Greenville and attention was called to the fact that the reports clearly show that much more sewage is being discharged into Greenville Creek than the creek can care for at times of low water without the creation of a serious nuisance. It was also pointed out that in the conditions of approval of plans for the sanitary sewerage system allowed by the Board in 1900 it was provided that within a period of five years the city should construct a suitable sewage disposal plant, which period had expired and



the hope was expressed that the city authorities would take up the matter without delay and submit plans of a disposal plant for approval of the State Board of Health.

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## REPORT OF AN EXAMINATION OF SLAUGHTER HOUSES AT LANCASTER.

On August 31, 1906, the assistant engineer visited Lancaster and made an examination of a number of slaughter houses in that city with a view to ascertaining their general sanitary condition.

The following report was made:

The following is a brief description of the various slaughter houses at present operating at Lancaster:

### SLAUGHTER HOUSE OF THIMMES BROTHERS.

This is a large slaughter house in the built-up portion of the city. The average numbers of animals killed per week are 20 cattle, 125 hogs, 20 sheep and 10 to 20 calves. In addition to killing and dressing the meat, sausage, head cheese, lard and other meat products are made. All solid waste matter from the entrails is saved and taken to the country where it is fed to hogs. All fat is rendered for lard and all solid matter capable of yielding grease is rendered for tallow. Liquid wastes, including large quantities of blood and some solid matter that is carelessly allowed to get into the drains, are conducted to the Hocking River through a private sewer. Conditions about this slaughter house were very slovenly and the ventilation poor. It would scarcely be possible to remedy matters without a reconstruction of the whole plant. All the floors are of wood and are thoroughly saturated with blood and liquid refuse from the various processes carried on. No great odor was noticed about the plant at the time of examination, but this was due to the fact that no rendering was being done. It is said that the odor becomes very bad at times and constitutes a nuisance in the neighborhood.

### SLAUGHTER HOUSE OF C. F. SNYDER.

This is a small slaughter house somewhat removed from the built-up portion of the town. The numbers of animals killed per week are about 2 to 3 cattle, 5 hogs and 3 calves. In addition to killing, sausage and various other meat products are made. Entrails are fed to swine and liquid wastes, including blood, are allowed to flow on to low lying land adjacent to the river. This place was in a very untidy condition, the floors all being of wood and very dirty, and bones with adhering particles of decaying flesh were lying about the premises. The area



back of the slaughter house where the drain discharges is saturated with putrefying liquid wastes.

#### SLAUGHTER HOUSE OF WEILAND BROTHERS.

This is another small establishment somewhat removed from the built-up portion of the town, killing per week about 5 cattle, 10 hogs, 2 sheep and 6 calves. Various meat products are manufactured. Rendering is done for tallow. Solid wastes are fed to hogs on the premises; liquid wastes, including blood and some solid matter, are allowed to run into the river. This place, as the previous one, was in a very untidy condition, the wooden floors being saturated with grease and the yard more or less littered with bones.

#### SLAUGHTER HOUSE OF CHARLES BAUMAN.

This is a small establishment in the built-up portion of the town. The numbers of animals killed per week average 6 cattle, 15 to 20 hogs, 4 calves and 5 sheep. This slaughter house is kept in a very cleanly condition in comparison with the others in the city, although there remains some room for improvement. Entrails and solid wastes are fed to hogs which are kept on the premises in a pen underneath the killing room floor. This is perhaps the worst feature about the place and undoubtedly causes odors at times. The liquid wastes, including a small amount of solid matter, are permitted to enter the city sewers. The floors are all of wood but are kept scrupulously clean. The cattle to be slaughtered are kept in a near by building which has a floor well above the ground and is kept clean and supplied with fresh straw. No odors were noticed about this place, though it is probable that some arise during rendering for tallow.

#### SLAUGHTER HOUSE OF C. H. SHURBURN.

This is a new establishment considerably removed from the built-up portion of the town. The average numbers of animals killed per week are 3 to 5 cattle, 7 hogs and 4 calves. The solid wastes are fed to hogs and the liquid wastes are allowed to run into a trough placed in the hog pen. The liquid overflowing this trough ultimately finds its way into a small creek known as Baldwin's Run. This slaughter house is quite small and has no suitable ice chest for preserving the meat. Dressed animals are sometimes allowed to remain hanging in the killing room for as long as twelve hours during the summer time. The odors about this place were very bad, due to the fact that bones with adhering flesh were allowed to lie about the premises in a decaying condition. The place being new made a somewhat presentable appearance, but from the way in which it is being used it will undoubtedly become a nuisance before a great while.

Near the slaughter house just described are two others, one belonging to George Clark and the other to Clark Brothers. Both of these places are small and used only occasionally. They were not entered, but the appearance of the premises would indicate that they were kept in no better condition than the slaughter house of C. H. Shurburn.

#### SLAUGHTER HOUSE OF D. & B. RUGH.

This is a small establishment somewhat removed from the built-up portion of the town and adjacent to Baldwin's Run. The numbers of animals killed per week average 4 cattle, 3 to 4 hogs, 3 calves and 2 sheep. No rendering is done on the premises, but sausage and other meat products are made. Solid wastes are fed to hogs kept on the premises; the liquid wastes, containing some solid matter, are allowed to enter Baldwin's Run. Although the construction of this slaughter house is no better than that of the others, it is kept in a fairly cleanly condition and no disagreeable odors were perceptible about the place.

Although four slaughter houses are at present discharging wastes into Baldwin's Run, the stream below them bore no evidences of pollution. On being probed with a stick the bed of the stream was found to be quite clean and numerous small fish were observed. The discharge of Baldwin's Run is perhaps one million gallons per day.

#### GENERAL SUMMARY.

The slaughter houses of Lancaster are generally poorly constructed and maintained in a slovenly manner. It cannot be said, however, that they are in much worse condition than the average small slaughter house in this state, but they are far from being conducted in the most approved manner. It would be highly desirable to have rules and regulations drawn up for the proper construction and maintenance of slaughter houses and providing for their location at a reasonable distance from built-up portions of the city.

September 25, 1906, a copy of this report was sent to the health authorities of Lancaster, attention called to the bad sanitary condition of some of these slaughter houses and they were advised to take up the matter and require that necessary improvements be made.

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#### REPORT OF AN INVESTIGATION OF SANITARY CONDITIONS AT LAKESIDE.

On June 21, 1906, the assistant engineer visited Lakeside for the purpose of investigating the general health conditions of that resort and also for making an examination of the public water supply and sewerage system.

The following report was made:

The village of Lakeside is a summer resort, located near the end of the peninsula which separates Sandusky Bay from Lake Erie. The village is incorporated under the name of The Lakeside Camp Meeting Association and is conducted in the manner of a private company. The population during the summer months is from 2,000 to 3,000, but during the winter this drops to about 400 or 500. The village proper has an area of about 50 acres, and is on ground that has a moderate slope toward the lake.

#### PREVIOUS EXAMINATIONS BY AND ACTIONS OF THE BOARD.

The attention of the State Board of Health was first called to the sanitary conditions of this community in 1896, at a time when there was prevalence of typhoid fever. Examination showed that the typhoid fever was, in almost every case, traceable to what was known as "the chapel well." This well was within 4 or 5 feet of a sewer which, at this point, was laid in rock and proved to be in a leaky condition. Further investigation of sanitary conditions in the village brought out several other matters that needed attention.

All of the cottages (of which there were a large number), the hotel and a public drinking fountain obtained water from the lake through an intake that extended not more than 100 feet from the shore and about  $\frac{1}{4}$  mile east of the sewer outlet. These conditions being called to the attention of the Lakeside authorities, an effort was made to secure an improved supply by means of a filtration plant. After the consideration of various plans, the State Board finally approved, on June 8, 1898, the use of a system of slow sand filtration, designed by Mr. J. P. Force, engineer, of Columbus; the plant to be used for filtering the entire water supply temporarily until a better constructed and more complete plant could be installed. These filters were put in operation July 14, 1898, and were examined July 16th of the same year. This examination showed but a slight improvement in the water after filtration, and this improvement was mostly in appearance; there was an actual increase in bacteria in the filtered water over the unfiltered water. As the filters had been in operation such a short time, it was deemed advisable to make another test, the result of which showed a somewhat better efficiency, though the filters were still doing very poor work. Of the three tanks then in use the following bacterial efficiencies were obtained:

Tank No. 1. 12 samples. Efficiency 55.3%.

Tank No. 2. 11 samples. Efficiency 64.7%.

Tank No. 3. 9 samples. Efficiency 63.3%.

During this test the lake water was low in bacteria, ranging from 352 to 525 per cubic centimeter. Filtered water ranged in bacterial content from 67 to 300 per cubic centimeter. Only two samples from each

tank showed a bacetrial content of less than 100 per cubic cenimeter. After this test the Lakeside company and also the engineer were notified that the filters were not giving satisfactory results and that necessary changes, especially in the method of controlling the rate of filtration, should be made at once.

Later on, in August, a second examination was made of the filters by the State Board of Health and, at this time, the filter's were apparently working at a slower rate and gave considerably better results. The following is the list of efficiencies given by the several filter tanks:

Filter No. 1. 6 samples. Efficiency 81.5%.

Filter No. 2. 6 samples. Efficiency 88.6%.

Filter No. 3. 6 samples. Efficiency 91.7%.

In all the tests the number of bacteria in the filtered water did not exceed 75 per cubic centimeter. Based on results of this test the Lakeside company was informed that if the grounds were to be open the following year the filters must be placed in good condition and that changes must be made which would insure that the rate of filtration shall never be greater than the estimated capacity of the filters and that another filter should be added in order to insure a sufficient supply of filtered water.

In 1899 another investigation of the general sanitary conditions of Lakeside and a third special examination of the filters were made. The general cleanliness of the village was found to be all that could be desired but the filters were still found to be overtaxed and doing poor work. The Lakeside company was urged to put in two additional filters, making seven in all, and secure more careful operation of the filtration plant. During the last mentioned test of the filters, bacteria in the unfiltered water were found to be on an average of 172 per c.c., in the filtered water 81 per c.c., thus giving an average efficiency of but 53 per cent. reduction.

In 1904, on July 17th and 18th, a fourth test of the filters was made by the State Board of Health. This test showed a bacterial efficiency, on the first day, of but 8.1% and on the second day of but 7%.

Later, in August, a fifth test was made which showed somewhat better results. The tests took place on the 30th and 31st of the month and showed an average efficiency of 60.4% reduction of bacteria.

It will be seen by these various tests that the filters never have done satisfactory work and this can undoubtedly be assigned to the crudeness of their construction and the small amount of attention given to their operation.

#### PRESENT EXAMINATION.

No regular tests of the efficiency of the filters at the time of this examination were made but it is not probable, from appearances, that they were doing any better work than usual.

The plant, at the present time, consists of 7 filter tanks, 6 of which are in use. The one out of commission is in such poor condition that in all probability it cannot be placed in service again. Four of the tanks in



use are in a very poor state of repair and leak badly. An examination of the controllers on several of these tanks showed that they were not working properly; the controller of one tank had been removed and that on one other tank was broken in such a way that it failed altogether to perform its function. The controller boxes on the other tanks were fastened in such manner that the controllers could not be inspected, and their condition could not be ascertained. It was admitted by the secretary and superintendent of the company that the filters were giving poor results and were not properly operated. He further stated that the company hopes, in the near future, to install a new plant of masonry construction and improved design, but that such an installation could not be afforded for the present season on account of the financial condition of the company. It is intended, however, to install a steel tank, or standpipe, on the hill near the filters to serve as a storage reservoir, so that the rate of filtration may be kept down to a point where acceptable results can be obtained; and then the following year to do away with the old filtration plant and install a new plant, probably of the mechanical type, near the pumping station where it can receive the constant attention of the pumping station engineer. The steel tank will be retained and increased in height to serve as a standpipe for storage and for equalizing pressure on the distribution mains.

*Water Supply of Lakeside Hotel.* The Lakeside Hotel, until 1902, obtained filtered water from the public supply, but, owing to the large consumption for flushing water closets and purposes other than for cooking and drinking, it was desired to decrease the load on the filters by supplying the water closet flush tanks with raw water. Accordingly, permission for making this change was asked of and granted by the State Board of Health, June 27, 1902. In granting permission to use this raw water supply, it was specifically stated by the Board that it was to be used for flushing water closets only. At the time of this investigation it was found that raw water was not only being supplied to water closets but also to all wash stands, bath tubs and kitchen sinks, thus making it accessible for drinking purposes. It was claimed, however, by the management that such use is never made of the raw water and that no glasses or other drinking vessels were kept near the raw water faucets. A supply of filtered water is kept in the lobby of the hotel and is cooled by passing the water through coils of pipe inside an ice chest. It was claimed also that only filtered water is used for cooking purposes.

*Sewerage.* The sewage of the village is collected in a system of vitrified pipe sewers and conducted to the end of a wharf near the western limits of the village. The sewers, as far as could be ascertained, are not very well constructed and there are but very few manholes allowing of their inspection. The sewer outlet consists of a 6 inch wrought pipe, several hundred feet in length, extending along the east side of the wharf. Though the discharge takes place about 150 feet from the shore, consid-



erable of the floating matter from the sewage is washed back to the shore and can be readily seen in the neighborhood of the wharf.

Recently a so-called septic tank has been placed on shore near the wharf. This tank, in construction, is very much like a large catch-basin. The main sewer enters this tank above the water level and the outlet takes the sewage at mid-depth. It is expected that much of the organic matter will be liquefied in this tank and that the heavy material will be deposited in the bottom, so that no offensive floating matter will be seen at the sewer outlet. The most that can be said for this installation is that it will somewhat improve appearances.

*General.* The general appearance of Lakeside is quite satisfactory; all the grounds seem to be clean and well kept and there are not the refuse heaps along the shore that are so frequently seen in some of the other Lake Erie resorts. There are several features, however, which are really objectionable. The public water closets, of which there are several, are in poor and unsanitary condition. Buildings in which these closets are located are poorly constructed frame structures, each containing a dozen or more closets and several urinals. The partitions between the male and female compartments are made of but one thickness of wood and do not extend to the ceilings. All of the water closets are of a very antiquated flush-bowl type and a number of them were found in a leaky condition. The urinals also are very poorly constructed and there is no protection for the surrounding wood work which is saturated with liquid and emits a disagreeable odor.

The lack of care and regularity in cleaning private vaults has also been the cause of well-founded complaint.

Another objectionable feature previously commented on by the Board is the fact that the bathing beach is immediately west of the wharf, at the end of which the sewage of the village is discharged. While the current in the lake has a tendency to run from west to east, yet a moderately strong east wind could readily carry much objectionable matter on to the bathing beach.

Later, a member of the Board, while at Kelley's Island, stopped at Lakeside to see what was being done there. The superintendent stated that he was quite anxious to have a modern filtration plant for the water supply and requested that the engineer of the Board furnish some estimate as to the probable cost of such a plant. In response to this request, the engineer made an approximate estimate of the cost of installing a satisfactory modern filtration plant at Lakeview, together with the cost of installing a new standpipe and pump.

The figures determined were as follows:

Mechanical filtration plant, 100,000 gallons per day capacity....	\$1,500 00
Slow sand filtration plant, 100,000 gallons per day capacity.....	1,700 00
Steel tank, including concrete base, 25,000 gallons capacity.....	1,200 00
Raw water pump and engine.....	360 00

The estimate was very approximate for the reason that there was no opportunity to investigate closely the cost of concrete work at Lakeside.

Attention was called to the fact that the cost of a mechanical filtration plant was about the same as that of a slow sand filtration plant; that the cost of operating a mechanical filter, however, would be somewhat greater than that of the slow sand filter and more constant attention and expert knowledge would be necessary with this type, and the Board therefore recommended that they build a slow sand filter, consisting of concrete basins, containing about  $3\frac{1}{2}$  feet of sand, for filtering material. Also that the total area of the filter should be about 1600 square feet, and it should be divided into two parts.

In order that they might reconstruct their water-works so that a safe supply will be provided for the people of Lakeside next season, the Board strongly urged that they at once retain an engineer to draw up definite plans and specifications for a slow sand filter plant together with stand-pipe, and that these be installed before next season.

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#### REPORT ON POLLUTION OF EAST FORK, LITTLE MIAMI RIVER, BY THE FREIBERG & WORKUM DISTILLERY, LYNCHBURG.

A petition was made to Governor Pattison in regard to the pollution of a stream at Lynchburg by refuse from a distillery. This complaint was referred to the State Board of Health, and on June 1st, 1906, the chief engineer visited Lynchburg, investigated all conditions relating to the matter, and made the following report:

*Recent Complaints.* Within the last ten days, a petition has been presented to Hon. John M. Pattison, Governor of Ohio, signed by some 130 inhabitants of the village of Lynchburg and of the valley of the East Fork of the Little Miami River for 15 or 20 miles below Lynchburg, claiming that that stream is being, and has been for years past, polluted by waste material from the distillery of Freiberg & Workum at Lynchburg. These wastes, it is claimed, cause the death of fish, render the water unfit for use and create conditions which are injurious to health.

Attached to this petition is also information reported to the governor regarding the pollution of the stream. It is claimed that 37,000 gallons of waste material, composed of blue vitriol, fusel oil, etc., is discharged daily. It is alleged that the company has put in an evaporating plant which cost \$35,000, but cost \$50 a day to run, so that the distillery company never operate it. As will be explained below, this information can not be verified.

*Past Conditions.* In 1904, action was brought against Freiberg & Workum by the Ohio State Fish and Game Commission for polluting the

East Fork of the Little Miami River. Before judgment was given, a compromise was effected by which both sides agreed to abide by whatever plans, for preventing such pollution, the State Board of Health should suggest.

In October, 1904, an inspection was made by the Board's chief engineer of the distillery at Lynchburg and, although the plant was not in operation at that time, from information obtained from those in charge and from personal observations of the distillery and surroundings, a report was made.

This report shows that some 30,000 to 40,000 gallons per day of waste "slop" was created from the manufacture of whiskey. This slop consists of cooked grain and is the residue from the stills after the whiskey is distilled off. The distillery company, in hopes of utilizing this slop and also as a possible source of profit, kept several hundred head of cattle which were fed upon it. The excrement from these cattle, very foul on account of their diet, together with a certain amount of slop which they refused to eat, was deposited in a large basin or so-called "pool" about half acre in extent and 3 feet deep. This pool was provided with an outlet into the stream, controlled by gates and its contents escaped to a greater or less extent at all times; sometimes slop was run direct to the river in addition. The mixtures of slop and filthy excrement from the cattle seemed to be the cause of the great pollution as existed in the stream for years past. From the rectifying department, however, there was discharged intermittently, in comparatively small quantities, wastes from the "second distillation" and rectifying process, causing some additional pollution.

The conclusions of this report were as follows:

"The prevention of pollution of the East Branch of the Little Miami River by wastes from the Freiberg & Workum distillery is a problem which can be satisfactorily and economically solved only by thorough investigation when the plant is in full operation. Such investigation should include accurate measurements of the quantity of slop which must be disposed of each day, and a measurement of the daily quantity of liquid waste which must be allowed to escape through the gates of the 'pool'; consistent with hauling away the usual quantities of manure. Chemical analyses of the wastes should also be made and experimental devices, such as tanks and filters, be operated before making any radical change in the present arrangements and methods.

"This problem is one which has no precedent, of which I am aware, to facilitate its solution; though some of the principles involved have been studied in connection with the disposal of other wastes. As the plant has not been operated since July and will not be started again until December, it is impossible at this time to obtain the data and make the tests mentioned above. Therefore no definite plan can now be recommended without further study."

The distillery was again placed in operation in December, 1905, or January, 1906, and just at this time it so happened that the State Board

of Health was making negotiations with the Bureau of Hydro-economics of the United States Geological Survey to make a co-operative study into the best methods of reclaiming or purifying certain industrial wastes in Ohio, for the purpose of preventing the pollution of streams. A contract between the State Board of Health and the United States Geological Survey was signed in February. Under this contract a representative from the government has been located in Ohio for the purpose of planning and doing the field work in connection with these tests, while the analyses have been made in the laboratory of the Ohio State Board of Health. The total expense of the investigation is to be divided equally.

Immediately after the signing of this contract, the problem of purifying the distillery wastes at Lynchburg was taken up. Thorough investigation into the manufacture of whiskey and the quantity and quality of all waste substances was made. After some three months study, it was decided that the best and most feasible method of disposing of these wastes was by evaporation. A plan was worked out whereby the waste slop, discussed above, instead of being fed to cattle, or discharged into the creek, could be evaporated at comparatively low cost and that the residue from such evaporation could be worked into dry cattle feed, and sold in connection with the cattle feed already being made by screening the slop, to a decided advantage; so that instead of imposing a hardship upon the distillery company, by making it properly dispose of its waste, this method offers a means of additional profit. At the same time it did away with the necessity and desirability of keeping a large number of cattle which had been directly or indirectly the cause of much of the stream pollution and offensive condition during past years.

Acting upon the result of these investigations, the distillery company contracted for and commenced the installation of an evaporating plant, capable of purifying, when properly operated, some 60,000 gallons of waste slop each day. This capacity is quite ample to take care of all the waste substances and completely obviate the necessity of polluting this stream.

*Present Conditions.* Since March 1906, the distillery has been inspected several times, either by the representatives of the United States Geological Survey, acting for the State Board of Health, or by the chief engineer of the Board. These recent inspections have shown that the installation of the evaporating plant has been practically completed. Though not in quite satisfactory working order, the plant has been evaporating a large portion of the waste slop. There seems to be no doubt, that at the present time the equipment is sufficient for purifying all waste substances. Furthermore, the water from the evaporating process, although entirely suitable to be discharged into the stream, may be utilized over again in the manufacture of whiskey; so that, no waste materials of any kind need be discharged. Incidentally it may be mentioned that predictions regarding the financial profit of evaporating these



wastes had been realized and the output of cattle feed has been beneficial both in quantity and quality. It is to the direct advantage of the distillery company, therefore, to purify all of its wastes.

Moreover, the keeping of cattle at the distillery during the last season has been discontinued and this point alone is a very decided step towards preventing the pollution of the stream as well as abating a local nuisance to the inhabitants of Lynchburg; to say nothing of the inhumane practice of keeping and feeding cattle under such unsanitary conditions.

*Discussion of Improvement in Quality of the Stream During Past Year.* In connection with the co-operative study above referred to as to the best methods of disposing of the waste substances, the condition referred to in April 1905 was thoroughly investigated and a set of chemical analyses made. At the time of making these analyses the stage in the river was fairly high and the dilution of the distillery wastes averaged 1 to 200. Even with this great dilution, the quality of the river water below the distillery produced extreme pollution, caused a strong, disagreeable stench, killed fish and rendered the stream entirely unfit for its natural uses for more than 6 miles below the distillery.

On May 5, 1906, the stream was inspected and another set of samples collected at the same points as those of the previous year. Although the flow of the river was very much less than in the year previous, on account of a smaller amount of rain fall, yet the quality of the water itself was somewhat better, thus showing that the total amount of matter discharged into the stream during the present season was undoubtedly considerable less than that discharged during the season previous.

During the inspection made on June 2, 1906, by your chief engineer, it was found that all the slop was being evaporated, except a small amount which leaked out of the vats and flumes into the "pool." It was also discovered that the clear water from the evaporator, harmless in itself, was discharged into this same pool, formerly used for the refuse from the cattle, but which had not been thoroughly cleaned out since the keeping of cattle was discontinued; and that on account of this method of discharging the clear water it was necessary to keep the gates open and to admit a large amount of water, highly charged with impurities taken up from the old cattle excrement, into the stream. The present pollution of the stream, therefore, seemed to be due to the discharge of this manure saturated water rather than to the whiskey slop. The discharge from the pool has probably been going on intermittently for about two months.

The pollution of the stream in this manner would seem to be entirely unnecessary and to be easily preventable, as there is no good reason for discharging the purified water from the evaporator into the pool of filth, there to be contaminated again. The attention of the authorities was called to this feature and the superintendent has been directed to tightly close the gates leading from the pool and to divert all liquid matter



from it so that the old excrement will become dry. This will then be removed and placed upon land during the coming summer when the distillery is closed.

On June 2, 1906, a study was also made of the conditions of the river for 6 or 7 miles below Lynchburg and a set of samples was collected at the same points from which the samples of May 5 were taken. The river on this date was said to be near its lowest stage, so that the dilution of the waste substance was very small. The stream, beginning at a point at which the above described liquid from the filthy "pool" was being discharged into it, at a point at least 5 miles down stream was in a most offensive condition and gave just cause for complaint from those living near it. The composition of the river water appeared to be similar to a weak sewage. As described above, however, this pollution consisted almost entirely of filth originating from the old cattle excrement in the "pool" and not from the whiskey slop. The condition of the stream was different from that on May 5, for the reason that the waste substances on first entering the stream were in a putrid and offensive state and also comparably great in quantity, whereas the examination of May 5 showed the pollution consisted principally of small amounts of slop which was not offensive until putrefaction took place at a point from a half mile to a mile down stream.

#### CONCLUSIONS.

1. The East Fork of the Little Miami River has for the last twenty years been seriously polluted for practically all, if not all, of the time.
2. The State Board of Health, at the request of the attorney general made an inspection of the conditions in October 1904, at which time the plant was closed down and no pollution was taking place. Further investigation was recommended as soon as the plant was put into operation.
3. In February, 1905, the State Board of Health, co-operatively with the United States Geological Survey, began a thorough detailed study into the best practical methods of disposing of the waste substances of the distillery without causing pollution of the stream.
4. Based on the result of this investigation, there was installed at the distillery an evaporating plant of a capacity of some 60,000 gallons per day, which is entirely adequate to dispose of all the objectionable distillery wastes without polluting the river.
5. Machinery has been installed by which the residue from the process of evaporation can be changed into the form of cattle feed and sold at a decided profit; thus making the disposition of the distillery wastes a matter of profit rather than of loss to the distillery company.
6. The keeping of the cattle which formerly constituted not only a great local nuisance but also the chief cause of pollution of the stream has been entirely done away with; although the filthy excrement deposited in previous years by the cattle, still remains.

7. The pollution of the stream during the past two months has undoubtedly been very great (partly on account of the comparatively low rain fall) and offensive conditions, detrimental to the comfort, if not to the health, of those living near the river have been created; and the waters of the river have been rendered unfit for stock watering or other purposes. From the investigations made, however, it appears that the total amount of material discharged into the stream this year has been considerably less than in previous years.

8. The pollution, during the past month or two, has undoubtedly been caused to a great degree by the fact that the waste water from the evaporating process, harmless in itself, has been discharged into the so-called pool which contains the accumulated filthy excrement from the keeping the cattle during years past and this water flows through this pool into the river, thus carrying a large amount of filth with it.

9. The distillery officials have agreed to immediately cease this method of discharging the waste water from the evaporators and to keep all liquid substances out of the pool so that it can be readily cleaned out during the coming summer.

10. The present conditions at the distillery appear to be such that there need be no further pollution of the stream if the following features are taken care of: (1). If the evaporating system is properly managed and cleaned when necessary. (2). If all leaky vats and flumes are repaired. (3). That waste from the rectifying department as well as all other wastes from the distillery be discharged into the evaporating plant. There is no reason, therefore, after the present filth is washed away by a freshet, why the stream should not be as pure below as above it.

11. The distillery will shut down for the present season on or before June 30th and will remain closed for three or four months.

A copy of the report was sent to Governor Pattison June 6, 1906, with the letter published in the June quarterly report of the Secretary.

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## REPORT OF THE POLLUTION OF CHAMPION CREEK AT MEDINA.

Complaint having been made to the Board of a nuisance arising from the pollution of Champion Creek at Medina by the discharge of sewage therein, the assistant engineer visited that place on July 13, 1906 and in company with the health officer, Mr. F. S. Harding, made an examination.

The following report was made:

The village of Medina is located in the central portion of Medina County, and is on the watershed of Rocky River, which discharges into Lake Erie a few miles west of Cleveland. The village at the present time has a population of about 3,000. There are no important industries

in the town. The village is provided with water-works, which is only in limited use for domestic purposes, owing to the scarcity of the supply. The construction of a new water-works system, also a system of sanitary sewers with purification works, is being contemplated, and will probably be installed in the not distant future. In 1904 a number of streets were paved in the central portion of the town, and at the same time a system of storm water sewers was laid. Plans for these sewers were not submitted to the State Board of Health for approval. All of the sewers discharge into a small creek known as Champion Run, running from west to east in the southern part of the village and naturally dry for the most part of the year. An inspection of the outlets of the storm sewers indicated that some of them were receiving small amounts of sanitary sewage, probably overflows from cesspools. Though the sewage was small in amount, it caused very unsightly conditions in the creek, for the reason that the bottom of the creek is uneven and permits the waste to stand in stagnant pools. The worst conditions were noticed at the points where Court Street and Vine Street cross the creek. At Court Street two of the 12-inch storm sewers discharging near the abutment carry a small amount of black offensive waste, which stands in stagnant pools immediately under the bridge and perhaps thirty or forty feet up and down stream. At the time of inspection the odors arising from the sewage were very offensive.

At Vine Street a 10-inch storm water drain discharges small amounts of black waste which causes conditions similar to those at the Court Street bridge.

In addition to the storm water sewers there are several private drains entering the creek which add to the general bad conditions. One of these drains belongs to Mr. Moody Shaw, and receives waste from his residence located on Smith Road, between Vine and Prospect streets. Another drain enters the ditch between West Street and Vine Street from a residence. A drain from the apartment house of O. Newmeyer, corner of Smith Road and Broadway, enters the ditch at Broadway crossing.

At a point about opposite East Street a creamery discharges wastes into Champion Creek, which stand in a stagnant pool and cause very offensive conditions. As there are no residences in the immediate neighborhood, the nuisance is seldom complained of.

July 31, 1906, a letter was addressed to the health officer of Medina, stating that the report of the engineer showed that a nuisance undoubtedly existed, and was due to the discharge of sewage, and, possibly, to the contents of some cesspools, into the creek, there not being sufficient water running to properly dilute the sewage. He was advised that the only remedy seemed to be the installation of a system of sanitary sewers and then the cutting off of drainage to the creek from house connections and cesspools.

As the Board had approved plans for a system of sewers with sewage disposal for Medina the attention of the authorities was called to this report and they were asked what had been done in the matter. The mayor replied that the plans for sewer system and for water supply were to be presented to council at its meeting August 14, and they would proceed as fast as possible.

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## REPORT ON ALLEGED NUISANCE CAUSED BY BREWERY WASTE AT MILAN.

The health officer of Milan, Mr. G. W. Curtis, on May 21, 1906, requested that a representative of the State Board of Health be sent to Milan to investigate a nuisance caused by the discharge of wastes from a brewery into a small creek in the south-eastern portion of the village.

May 28th, a petition was received from three persons living near the creek, asking the Board to give the matter immediate attention.

Accordingly the assistant engineer visited Milan on May 29th, and made an examination of conditions, with the following report:

The village of Milan is located in the south-central portion of Erie County and has a population of about 800. The topography in the neighborhood is undulating to hilly. The village has a public water supply of poor quality. It is obtained from a surface reservoir fed by ground water and usually contains rank growth so that people in the village cannot use it for drinking purposes. There is no regular sewerage system, but a number of storm water drains exist that discharge into the Huron River or Village Creek a small tributary of the Huron River. A number of these sewers are used for domestic purposes and are frequently complained of as causing a nuisance.

In the south-eastern portion of the village is the brewery of The Joseph Herb Brewing Co., which makes about 60,000 gallons of beer per day. The wastes from the brewing process, as well as the sewage from this establishment, are discharged into a small creek which is really no more than a ditch at the bottom of a small ravine and but for the wastes discharged into it would probably be dry during the most of the year. The wastes discharged are washings from the mash-kettles, from the fermenting vats, storage kettles and from the washing of bottles and barrels. In all it amounts to about 10,000 gallons per day. At the outlet of the waste drain, just where it enters the ditch, the only odor perceptible is that of brewers' yeast.

The ditch is in very bad condition, inasmuch as no attempt is made to maintain a channel. The flow, therefore, covers marshy places of considerable area where putrefaction takes place very actively giving rise to disagreeable odors. This ditch extends about three-fourths mile before reaching Village Creek to which it is tributary. Following down the



creek the disagreeable conditions are noticed perhaps a distance of half a mile from the brewery. Beyond this point, however, it appeared that effective purification had taken place for the water was quite clear and had but a very slight odor. As it entered Village Creek it gave but very little evidence of pollution. There are but three houses near enough to the ditch to be affected by the nuisance and all of these are near the brewery. It would seem that the difficulty could be remedied either by digging a well defined channel for the ditch and maintaining it in good condition, or by laying a vitrified tile pipe, with cemented joints, for carrying the wastes further down stream, say perhaps a distance of a quarter of a mile, and below this point improving the channel. The local conditions would permit of a purification plant being installed with comparatively little difficulty, but it is doubtful whether this is a necessary expense since the stream runs a sufficient distance through uninhabited country for the wastes to be made harmless.

Samples of brewery waste from a Columbus brewery were taken with a view to ascertain their general character and tendency to putrefy. It was found that waste from the fermenting tanks were quite putrescible in dilutions of 1 to 4 and 1 to 9, the greater concentrations showing but a slight tendency to putrefy. The putrescibility of the washings from the first storage tank was very high in the straight sample while in the high dilution (1 to 9) it was but slight. In the case of washings from the second storage tank very high putrescibility was found in the high dilutions. Taken as a whole, all the wastes may be said to be highly putrescible and the odor given off is very disagreeable.

Mr. Stabler, assistant hydrographer of the U. S. G. S., and now working in conjunction with the Ohio State Board of Health on the treatment of trade wastes will soon take up the study of brewery wastes with a view to reclaiming the valuable ingredients and at the same time rendering final waste innocuous. Perhaps the results of his studies may be applied to the betterment of conditions at Milan.

June 13, 1906, a copy of this report was sent to the health officer of Milan and he was advised that from the report, it appeared that the most reasonable way to abate the nuisance would be to extend the drain from the brewery for a distance of about 1,000 feet and allow it to discharge into a ditch at a point well removed from any habitation.

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#### REPORT ON UNSANITARY CONDITIONS IN THE VILLAGE OF MILO, MARION TOWNSHIP, FRANK- LIN COUNTY.

At the request of Mr. A. Kessler, township trustee, Marion Township, the assistant engineer visited the village of Milo, on the evening of



October 16th, 1906, for the purpose of making an investigation of the unsanitary conditions at that place.

The following report was made:

The village of Milo lies just north of the city of Columbus and has a population of perhaps several hundred. Most of the houses are built on a single street, known as St. Clair Avenue. All surface drainage, together with sink drainage from a majority of the houses and wastes from a dairy, find their way into an open ditch or gutter about 1,600 or 1,700 feet long, and running directly through the most thickly built-up portion of the village in a southerly direction towards the Norfolk & Western Railroad tracks. It then discharges into an open ditch parallel with the railroad tracks and extending towards the westward for perhaps half a mile, where it in turn discharges into one of the Columbus city sewers. The ditch on St. Clair Avenue always contains more or less filthy water, much of which is stagnant. At nearly all times, and more particularly in the summer time, the ditch gives rise to very offensive odors; furthermore, it is unsightly and an obstruction. It is desired by a part of the residents to replace the ditch with a properly constructed sewer, but on account of the expense, many of the property owners are unwilling to favor the introduction of such a sewer. The need of it, however, is very evident to the most casual observer and the village should be strongly urged, both for health and cleanliness, to introduce the same.

In view of the fact that this sewer will discharge into the open ditch parallel with the railroad tracks it should not be permitted to receive sanitary wastes. It is anticipated, however, that in the course of a few years, the open ditch will be replaced with a properly constructed sewer, which will be part of the Columbus city sewerage. In this event there should be no objection to the use of the sewer in St. Clair Avenue for domestic wastes, provided it is properly constructed.

Another matter investigated is the unsanitary condition in which the dairy, belonging to Mr. William Williams, and above referred to, is maintained. The land occupied by it is perhaps 100 feet square and on this are maintained about twenty-five cows, and an equal number of hogs. The premises are apparently never cleaned and the stench arising therefrom is exceedingly foul. Owing to the proximity of many residences and other buildings, this place should be cleaned at once and should be regularly maintained in the best possible condition.

#### SUMMARY.

1. The construction of a sewer in St. Clair Avenue is necessary. It should be made of vitrified sewer pipe carefully laid with tightly cemented joints, and until it is given a direct connection with the Columbus city sewer it should be used for carrying storm water, sink drainage, and surface water only.

2. The nuisance occasioned by uncleanly conditions of the dairy should be abated.

October 20, 1906, a copy of this report was sent to Mr. Kessler, who had requested the investigation, and to the trustees of Marion Township, Franklin County.

Their attention was called to the very great need for the construction of a sewer in St. Clair Avenue, and the hope was expressed that they would make this necessary improvement at once.

They were advised that as a board of health for the township, the law made it their duty to abate all nuisances within their jurisdiction, that there was no question, apparently about this dairy being in a condition to create a nuisance, and that the owner should be required to thoroughly clean it and keep it in a cleanly condition, or, if it were impossible to maintain a dairy at this place without a nuisance, their board had authority, and should exercise it, to prevent this place being used as a dairy.

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## REPORT ON UNSANITARY CONDITIONS CAUSED BY A STORM SEWER AT MINSTER.

While the assistant engineer was at Minster on July 10th, 1906, he investigated the unsanitary conditions caused by an improperly constructed storm sewer, recently built by the commissioners of Auglaize County, and discharging into the Miami and Erie Canal.

The following report was made:

On the west side of the Miami and Erie Canal in the village of Minster, is a district which until recently was drained by an open ditch. This ditch being usually in a poor state of repair overflowed its banks and inundated the entire neighborhood to a depth of several inches. Conditions became so bad that the village of Minster requested the county authorities to install a storm water sewer to take the place of the ditch, and to assess the cost on property owners according to benefits received. The county built a 4-foot, brick, storm water sewer from the canal to a point on the opposite side of the first street west of and running parallel to the canal. At this point it was terminated by a large opening built in a manner similar to a catch basin opening. The ditch which formerly extended from the end of this sewer to the westward has been filled up. The result is that conditions since the construction of the sewer are worse than they were before. All the water coming from the country lying to the west must rise to the surface of the ground at a point where the ditch has been filled in and find its way the best it can to the opening to the sewer above mentioned. When this sewer was installed the plans were not submitted to the State Board of Health for approval.

Unless the new storm sewer is continued westward for a considerable distance, it will entirely fail to perform its function.

July 28, 1906, a letter was addressed to the commissioners of Auglaize County stating that from the report of our engineer it appeared that the ditch, which was intended to carry the drainage from a considerable area into the upper end of the storm sewer recently built by them, was filled so that proper drainage through it was impossible, that unsanitary conditions, caused by the flooding of a certain portion of the village, were periodically created, and the storm sewer should be continued in a westerly direction to such a point that the drainage might readily enter it; or the ditch should be properly cleaned and graded, so that it would readily convey the drainage to the storm sewer.

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### REPORT OF THE SANITARY CONDITION OF MORROW.

On August 24, 1906, the assistant engineer visited Morrow for the purpose of making a general investigation of the sanitary conditions existing in that village.

The following report was made:

The village of Morrow, having a population of about 1,100, is located in the southeast portion of Warren County on the Little Miami River. The area within the corporation limits is 0.5 square mile, and about one-half of this area is built up. The village has neither a public water supply nor sewerage system. The water in general use is obtained from private and several public wells, and is used for all domestic purposes. It is sufficiently soft so that rain water cisterns are seldom used. The built-up portion of the village lies on a strip of bottom land, the general elevation of which is about thirty feet above the level of the river. Geologically this bottom land seems to be composed of a surface layer of clay and loam some ten to eighteen feet in thickness, then a stratum of gravel three to eight feet thick, this being underlaid by a thin stratum of what is locally called hard-pan, but which would appear from the Ohio Geological Survey Report to be composed of "large slabs of blue limestone being sometimes laid against one another in almost regular courses." Below this layer is found coarse gravel to a considerable depth, probably at least fifty feet, and it is from this deposit that practically all of the wells obtain their supply.

No effort has been made to place privies and cess-pools at reasonably safe distances from the wells, and it has been feared by some of the village authorities that wells are dangerously polluted and that an epidemic of typhoid fever might result from their continued use. In general privies and cess-pools are constructed by sinking a hole in the ground to a depth of from ten to fifteen feet and protecting the excavation by

loose walls of stone or brick; in some cases the sides are protected merely by planks. Many of them are located within twenty or thirty feet of wells. That material from these privies and cess-pools penetrates the soil is indicated by the fact that they rarely ever become filled. Private wells are usually driven and extend to a depth of twenty-five to thirty feet; that is, they are just deep enough to get below the layer of hard-pan. There are three public wells located in different parts of the village which are drilled and extend to a considerably greater depth (fifty to sixty feet) and are protected by steel casings for their entire depth. Water in all wells rises within the casing to about ten feet of the surface of the ground. The water obtained from the wells is generally clear and colorless in appearance and quite cool, and is believed by many to be of excellent quality owing to the fact that it is obtained from below the impervious layer of hard-pan.

In order to test the quality of these wells four samples of water were taken from four separate wells in different parts of the town. The analyses of these, together with the chemist's report on the same, are herewith submitted.

Sample No. 5600 represents a public well near the center of the main portion of the village. This well is on a street corner, one of the streets being 100 feet wide and the other about 30 feet wide. Both sides of both streets are solidly built up and the houses are provided with privies and cess-pools similar to those above described. This water, it will be seen, is of good quality and shows practically no evidence of organic influence. The very high number of bacteria is not taken into account, as it is so out of accord with the other constituents as to indicate accidental contamination.

Sample No. 5601 is from a private well located in the central portion of the village and is typical of a great many other wells in that neighborhood. It is a driven well twenty-four feet in depth and passes through the hard-pan which is here three feet in thickness and is encountered at a depth of twenty feet. Forty feet to the east—that is, in the direction from which the ground water flow is believed to come—there is a privy vault ten to twelve feet in depth. Thirty-five feet to the northeast is another privy vault of similar construction. About sixty feet to the southeast is a privy vault of an adjoining saloon, which is also used as a cess-pool for general sink drainage and house wastes. The analysis indicates that this well is being influenced by these sources of contamination, but to not so great an extent as one would anticipate from their proximity. The water at the present time would seem to be of fair quality, but owing to the constantly increasing pollution of the soil, the use of this well may at any time become dangerous.

Sample No. 5663 was obtained from a well located near the river bank and presumably intercepts the flow of ground water that has passed under the built-up portion of the village. There are no immediate pos-



sible sources of pollution about this well, the nearest privy being about 100 feet distant. The sewage from the house to which the well belongs is carried by means of a pipe drain direct to the river. The analysis indicates this water to be of good quality, though slightly inferior to that obtained from the public well. The number of bacteria is quite low.

Sample No. 5664 was taken from a public well in the northern portion of the village and on the opposite side of the river. This well is located in the midst of a built-up district, although the houses are not as close together as in the locality of the other public well. This well is fifty feet in depth. It does not pass through an impervious stratum. The analysis indicates the water to be of good quality at the present time, but the large amount of nitrates indicates polluting influences. It should, therefore, be guarded with suspicion and frequent analyses made in order to determine its quality from time to time.

In general it would seem that the stratum of hard-pan forms a very effective protection to the wells, but this should not be relied upon in as much as this stratum is not continuous and in places is of very slight thickness. Should a cess-pool be so located as to contaminate the gravel lying below this stratum great injury might be done to wells within a wide area. In view of the fact that such an abundant supply of good well water may be found in the valley of the Little Miami it would seem highly advisable to install a public water supply for the village, the wells serving as a source of supply to be located on a plot of land sufficient in area to make pollution practically impossible. The use of wells throughout the built-up portion of the village should then be discouraged for the reason that the increased number of cess-pools and privies and the possibility of such being located over a point unprotected by the impervious stratum of hard-pan would more and more endanger the quality of the wells now in use.

During the investigation attention was called to a nuisance caused by a canning factory which disposes of immense quantities of green corn husks and corn cobs by throwing them into the river. These wastes lodge on the banks and among weeds adjacent to the banks and there undergo putrefaction. The odor arising from this material — particularly the corn cobs — in a state of decomposition is exceedingly offensive and at times becomes so bad as to make the residences along the river front almost uninhabitable. Efforts have already been made to prevent the canning company from so disposing of its wastes, but without effect.

#### GENERAL SUMMARY.

1. It would seem from the investigation that many of the private wells throughout the village are or may soon become a source of danger. Their quality at present, however, is considerably better than would be supposed from an examination of their surroundings. This is undoubtedly due to the protection afforded by the stratum of hard-pan, but owing



to the fact that this stratum is not continuous it could not be relied upon to maintain the purity of all wells.

2. It would be advisable for the village to install a public water supply, which, in addition to insuring the village a good potable water, would also furnish fire protection and water for street and lawn sprinkling.

3. Necessary steps should at once be taken to abate the serious nuisance caused by the discharge of decomposing wastes from the canning factory.

September 25, a copy of this report was sent to the board of trustees of public affairs and their attention called to the fact that many of the wells were located quite near to privies and cesspools, and might become seriously polluted at any time, and it would be well for them to consider the advisability of installing a public water supply from a source which would guarantee its purity.

The report was also sent to the health officer and his attention called to the nuisance at the canning factory which ought to be abated. He was advised that one way of getting at such nuisances was through a county inspector of nuisances, appointed by the county commissioners, though there appeared to be no reason why the board of health would not be sustained in an order to prohibit conditions giving rise to this nuisance, and the board should take such action.

#### REPORT OF EXAMINATION OF WATER FROM MORROW.

These samples were received on August 25th and 28th, the first two samples having been collected by the assistant engineer and the last two by Dr. A. C. Roberts.

Examination gave the following results:

#### PARTS PER MILLION.

Source of sample.....	Public drill'd well N. E. Cor. R. R. and Miran- da streets.	C. S. Sacker driven well	Dr. A. E. Roberts driven well	Public drill'd well Cor. of Mill & Turnpike streets.
Number of sample.....	5600	5601	5663	5664
Color .....	8.	trace	10.	5.
Turbidity .....	trace	trace	15.	4.
Sediment .....	trace	trace	decided	slight
Odor .....	none	none	none	none
Oxygen required.....	.46	.69	.50	.23
Ammonia albuminoid ..	.014	.004	.022	.058
N. as { Ammonia free .....	trace	trace	.038	trace
{ Nitrites .....	trace	.002	trace	none
{ Nitrates .....	none	6.0	none	10.0
Chlorine .....	10.2	18.2	5.6	5.4
Alkalinity .....	276.	268.	258.	296.
Incrustants .....	30.	.....	.....	3.
Total solids.....	503.	453.	333.	398.
Loss on ignition.....	204.	128.	.....	.....
Iron .....	0.3	0.3	.....	.....
Number of bacteria per cc....	7000.	375.	45.	200.
Colon bacilli present.....	not in 50cc.	not in 50cc.	not in 50cc.	not in 50cc.

No. 5600. Public well drilled northeast corner of Railroad and Miranda streets. It will be noticed that this water is of good appearance, is practically free from ammonias, nitrites, nitrates and oxygen required. Intestinal bacteria were not present. The number of bacteria is high, but the finding is so out of accord with the rest of the analysis as to indicate the possibility of an accidental contamination. The water is only a moderately hard one. From the foregoing findings it is evident that this water at this time shows no trace of past or present pollution from any of the nearby privies or cesspools and it is a satisfactory water for a public well.

No. 5601. C. S. Sacker driven well. As regards present pollution the same may be said of this well as was said of the public well, No. 5600, but the Sacker sample in its nitrites, nitrates, and increased chlorides does give evidence of an influence from sewage sources. This influence although more or less remote in time or distance is undesirable. On account of the very low chemical findings, indicative of the absence of fresh pollution, together with the bacterial findings, it is evident that this water is a usable one, although undesirable on account of "past pollution" influences.

No. 5663. Dr. A. C. Roberts driven well. This sample is not as pleasing in appearance as the others on account of the suspended matter. The very low number of bacteria, the absence of intestinal bacteria and the satisfactory chemical findings indicate that it is a usable water, free from evidences of past or present pollution. It is a somewhat softer water than either of the others and would be classed as a satisfactory water for domestic use.

No. 5664. Public well drilled corner of Mill and Turnpike streets. This sample in its chemical and bacteriological findings gives satisfactory evidence of freedom from fresh organic pollution, but it will be noticed that the nitrates are high indicating some past pollution influence, although the chlorides are not as high as might be expected. This water would be classed as usable at the present time, although the past pollution influence is an undesirable factor.

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## REPORT ON NUISANCE AT WILLOW BROOK PARK, NEAR NORWALK.

In response to a request from the clerk of Norwalk Township, Huron County, the assistant engineer on August 1, 1906, visited Norwalk for the purpose of making an investigation of a nuisance caused by the discharge of sewage into an artificial lake at Willow Brook Park.

The following report was made:

Just east of the city of Norwalk is a trolley resort known as Willow Brook Park. The owners of this park have formed an artificial lake by

damming up a small stream passing through the grounds. The area of the artificial lake thus formed is about one and one-half acres, with a depth varying from one and one-half feet near the banks to a depth of ten feet at the site of the dam. Discharging into this lake is a drain constructed by Huron County. This drain is constructed of about 15-inch vitrified sewer pipe laid with open joints. The territory tributary to the drain is perhaps a square mile in area and lies to the westward of the park on higher ground. Surface washings have access to the drain through several manholes and considerable water finds its way into the pipe through the open joints. About 300 feet from the lake is a large, shallow cesspool, within a few feet of the tile drain, which receives all of the closet wastes and some other mixed refuse from an umbrella factory employing perhaps 50 hands. Fecal matter from this pool very likely finds its way into the drain and at times of heavy rains is washed into the drain directly in considerable quantities through the open joints. At the time of inspection it would seem that comparatively little waste was gaining access to the drain. About 60 feet from the outlet into the lake the drain is said to receive directly the overflow from a cesspool belonging to one of the buildings in the park. This cesspool was entirely covered up and there were no means available for ascertaining the manner of its construction. At the outlet of the drain there was every evidence that it received some sewage. Just previous to the time of inspection there had been considerable rain and conditions were not at their worst. However, the bottom of the lake near the drain was coated with a considerable thickness of black sludge, very typical of sewage deposits. The entire lake contained more or less of this black sludge in the bottom, but at points farthest removed from the outlet of the drain it was scarcely more than half an inch in thickness. No disagreeable odors were perceptible at the time, but it is said that in dry weather the stench becomes almost unbearable to persons living in the immediate neighborhood. The conditions described undoubtedly constitute a nuisance at times and the only remedy would be to have the joints of the tile drain carefully closed with cement mortar at points where it is liable to receive sewage material and to prevent the overflow of the above described cesspools from discharging into it or in any other way reaching the lake. That the bad conditions are caused by sewage from these two places was made evident by the fact that water in a catch basin above them was found to be very clear and absolutely without odor that would indicate the presence of sewage.

August 30, 1906, a copy of this report was sent to the township health authorities with a letter stating that without doubt a nuisance existed, which should be abated by them, and that the Board would recommend that they adopt an order requiring the owners of the park to put in properly constructed vaults, so that it would be impossible for any

sewage to gain entrance to the lake. A copy of the report was also sent to the owners of the park.

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## REPORT ON A NUISANCE AT OXFORD CAUSED BY IMPROPER SEWERAGE.

The complaints of Mr. H. A. Davis and W. E. Calohan, health officer of Oxford, in regard to a nuisance caused by the escape of sewage from an old stone drain in that village were referred to the member of the Board from that district for investigation. He visited that place April 30th, and the following report was made:

Oxford is one of those unfortunate places that has a public water supply without having a system of sewers. A stone drain which was made many years ago, supposedly to carry away the waste from a tanyard, has been made the receptacle for house sewage from at least eight houses and a laundry. The sewage escapes from the drain onto private property a short distance south of South Street, re-enters the drain two or three hundred feet further down and again escapes on the property of Mr. Gibson near Spring Street, flowing thence into an open gutter on the north side of Spring Street, then one square east to East Street, then south on the west side of East Street several hundred feet, where it discharges into a branch of Bull's Run. The amount of water in the branch is small even at this time of the year and in summer it is completely dry. Before discharging into the branch there is little dilution of the house sewage except such as comes from the laundry. The result is a nuisance that is a serious annoyance to the occupants of several residences on the streets through which the sewage flows.

Two ways may be suggested to abate the nuisance, one, by the discontinuance of use of the stone drain as a carrier of sewage, the other the construction of a sanitary sewer that would carry the sewage beyond the residential part of the village. The latter (unless extended to Bull's Run, nearly one mile from the starting point) would only remove the nuisance from the proximity to residences to the side of a little used street.

To effect a radical cure the sewer should be continued to Bull's Run, a tributary of the Great Miami River, which at all seasons carries sufficient water to so dilute the sewage as to prevent a nuisance.

The village council should be urged to adopt a system of sewers for the village that shall have an outlet into Bull's Run, and the health officer should order the discontinuance of the stone drain as a receptacle of sewage.

May 7, 1907, a copy of this report was sent to the mayor and council and to the health officer of Oxford and they were urged to take proper action in the matter.



Later a complaint was again made of this nuisance and the attention of the authorities called to it. The complainant was advised that if the authorities still refused to take action, those injured by the nuisance could commence action for its abatement, and also if it could be proven, for damages for depreciation of property due to the nuisance.

In December the authorities presented plans for sewerage and sewage purification for Oxford, which were approved.

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## REPORT OF UNSANITARY CONDITIONS CAUSED BY IMPROPER DRAINAGE AT PAYNE.

Complaint being made to the Board of unsanitary conditions at Payne, due to improper drainage, the assistant engineer visited that place December 12, 1906, for the purpose of investigation.

The following report was made:

The village of Payne lies in the southwestern portion of Paulding County, on a small stream known as Flat Rock Creek. The surrounding country is exceedingly level. The soil, being of a thick tenacious clay overlaid by but a thin layer of loam, renders drainage very difficult. In this region rock is generally found at a depth of 30 feet. The drift material consists principally of the clay above referred to, but there are also considerable deposits of sand and gravel. Such deposits furnish the supply for shallow wells in the vicinity. As the quality of the water from these shallow wells is frequently poor and the quantity also insufficient, many deep wells are in use; these invariably penetrate the limestone to a considerable depth, seldom, however, over 200 feet. The area of the village within the corporation limits is about one square mile and the population is about 1,400. The built-up portion of the village is spread over a considerable area, so that municipal improvements are expensive and have been made but slowly. At the present time most of the sidewalks are well paved, and a few blocks of roadway in the business portion are also paved.

In 1902 plans for the construction of a combined sewerage system were submitted to the State Board of Health for approval. These were disapproved, but the Board permitted the village to use such a system for storm water only, advising them at the time that when sanitary sewerage became necessary the village would be compelled to put in a separate system which would conduct all domestic sewage to a purification plant. The village was also advised that the expensive system proposed was scarcely necessary for storm water and that drains might be laid, as needed, for this purpose and permitted to discharge into the nearest ditch or stream. Nevertheless, the system was put in as originally designed, though the connections for sanitary sewage have been prohibited



by ordinance. Notwithstanding this ordinance, there are said to be some half a dozen cesspools connected with the sewerage system. All of the sewers planned were not laid at once, much being left to future extension. The main sewer, which lies in Merrin Street, was extended to a point one block west of Main Street, though the street continues for about half a mile beyond. During the last year the property owners on Merrin Street beyond the point where the sewer terminates, wished to have the sewer extended and petitioned the council accordingly. The petition was signed by nearly all of the property owners affected. The extension was approved by the council and the village attorney was directed to apportion the assessments. Nearly a year has passed since the petition was made and nothing has been done in the matter, and it seems impossible for those interested to obtain action from either the council or the village attorney. In the hope of bringing the matter to an issue, a number of citizens petitioned the State Board of Health to make an examination relative to the necessity for continuing the sewer for sanitary reasons. All the evidence obtained during the investigation following this petition, indicated that the streets are frequently flooded during wet weather and that for weeks at a time are impassable without the use of rubber boots. Furthermore, many cellars are flooded and wells are polluted by the entrance of surface water. Attention was called especially to the condition of the public school building which is in the district affected. It was stated that after continued rains, the floor of the basement of the school is covered with water to a depth of from two to six inches. The frequency with which this flooding of the basement occurs was differently stated by different persons, but apparently, as yet it has not happened more than once or twice a year. The children going to the toilet rooms are required to walk on planks supported on bricks and stones, and it occasionally happens that a child losing its balance falls off into the water. Conditions along that part of Merrin Street not provided with sewerage are undoubtedly bad and should be remedied at the earliest possible time, more especially in view of the fact that the great majority of property owners and residents affected are strongly in favor of the improvements.

Aside from the main object of the investigation, it was learned that there has always been a great deal of typhoid fever in Payne. The health officer was questioned as to its source, but could give no definite information. Apparently, much was due to personal contact, but the primary cases had the appearance of being due to polluted shallow wells. The local authorities should be advised to look to the sanitary conditions of the village more thoroughly than has been done in the past and all polluted wells and improperly constructed privies should be condemned. During previous investigations made by the State Board of Health in connection with the construction of sewers, the large amount of typhoid fever was brought to the attention of the local health authorities, but

nothing was ever done in the matter. The local authorities were also advised that as soon as the village was able to do so, a public water supply of good quality should be installed, and this advice would seem to hold good at the present time.

A copy of this report was sent to the mayor and council of Payne, January 8th, 1907, and their attention called to the apparent very great need for this extension of the sewer in Merrin Street, as recommended by the engineer and desired by property holders along the line of the sewer. The hope was expressed that council would grant this extension, as the means of abating the nuisance justly complained of.

A copy of the report was also sent to the health officer, and he was urged to do all in his power to bring about the needed extension of this sewer.

His attention was called to the considerable amount of typhoid fever in the village, a matter that should be thoroughly looked into, and he was assured that he had ample authority to condemn and order closed, any wells that might be shown to be polluted and the cause of typhoid fever cases.

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## REPORT ON A NUISANCE IN PERRY TOWNSHIP, STARK COUNTY.

In March and again in April, 1906, complaints were received of an evil stench at the yards of the Wheeling & Lake Erie and the Baltimore & Ohio railways. This stench it was said, came from the bodies of dead horses that had been hauled to a patch of ground across the Tuscarawas River from the said yards.

The matter was referred to the member of the Board from that district, who visited the locality, April 6, 1906, with one of the trustees of the township.

The following report was made:

The ground is in Perry Township about one mile east of Massillon.

Inquiry developed the fact that, in consideration of permission to haul the carcasses of dead animals to this spot, and of the hides and bones, Welsbaugher, the owner of the ground, had agreed to bury the carcasses so that there would be no nuisance; also that Welsbaugher had done the burying in a very slouchy manner; in fact, that the carcasses were often left on the surface without any attempt at burial. This had been going on for some years, and complaints have arisen from persons living at some distance, even from some city residents nearest the spot in question. With the removal of the railway yards to a point just across the river the nuisance has assumed a phase so serious as to call for its permanent abatement. This fact is thoroughly recognized by the health

authorities of Perry Township who had already, prior to my visit, taken steps to suppress any cause of complaint in the future.

On the day of inspection the conditions amply justified the complaint of the railway men. The carcass of a horse, thinly hidden under dead weeds, had commenced to exhale an evil smell; a few days of hot sun would render presence in the vicinity very undesirable. Welsbaugher promised the township officer, in my presence, that the carcass should be properly buried that day; he also declared that no carcasses should be brought upon his grounds in the future. Mr. Frank K Norwood, the township health officer, will see to it that the terms of the law (Sec. 6923 Revised Statutes) are complied with; also that the penalties for violation of the same are exacted.

It is to be hoped that the health officer will not tolerate any more dead animals on the Welsbaugher tract. The bones and skeletons scattered about give it a very repulsive aspect. Welsbaugher himself pointed out where he had buried scores of carcasses. The spot is only a few feet from the edge of the Tuscarawas River, and its leechings, of necessity, flowed directly into that stream. What a foul contribution to its pollution! Besides, whoever buries a carcass at that spot violates the law above referred to. The burial of the carcass already on the ground was only permitted because of its partial decay and the difficulty of removal.

The health officer of the city of Massillon, Dr. T. Clarke Miller, is a gentleman who stands in the front rank of the sanitarians of Ohio. He said: "There is no provision made here for the safe and decent disposal of city garbage wastes, dead animals, etc. I have endeavored to convince our city authorities that something should be done; not a cent has been made available for any such purpose up to this time. When the necessity arises I make the best arrangement I can with some private, often irresponsible, party to attend to the matter. The carcass at Welsbaugher's was probably spirited away during the winter, and in the night; no permit was given. When permits are granted it is always on the condition that the wastes shall be disposed of in such a manner as to be safe and inoffensive. With the best that can be done there are complaints, often well justified, but it cannot be helped."

The volume of wastes produced by a city is large, and it is apt to be, or become, noxious and dangerous. It is permissible to say that the authorities of Massillon should lose no time in putting their city into harmony with more civilized methods. The defilement of the stream, and the imposition of the city's nasty, but inevitable, waste products upon innocent parties should be corrected. A properly equipped department will conserve health and comfort for the people of the city without menace to themselves or their neighbors.

Copies of this report were sent to the complainants, the health officer of Perry Township, and the health officer of Massillon, April 10th, 1906.



EXAMINATIONS MADE IN THE  
LABORATORY.

(391)





## WORK OF THE LABORATORY.

This part of the report deals with the various examinations made in the laboratory during the year ending December 31, 1906. The work has been done by Dr. Elmer G. Horton, Bacteriologist and Chemist in charge of the laboratory, assisted by Mr. C. B. Young, Mr. L. V. Parker and Mr. H. A. Whittaker. The number of samples examined during the year was 3,555.

In addition to the routine work the laboratory engaged in the following special investigations:

- a. Typhoid fever at Chardon.
- b. Typhoid fever at Kenton.
- c. Occasional examinations of certain public water supplies.
- d. The efficiency of filtration in public water supplies in Ohio.
- e. A study of sewage effluents, manufacturing wastes, and stream pollutions in co-operation with the United States Geological Survey.
- f. A study of various sewage disposal plants of the state.
- g. A study of the effect of copper sulphate on colon bacilla in sewage in co-operation with the United States Department of Agriculture.

The expenses of the laboratory during the year were:

Salaries .....	\$4,016 50
Apparatus, supplies and incidentals .....	1,196 10
Traveling expenses .....	30 94
Total .....	\$5,237 54

## EXAMINATIONS OF DIPHTHERIA SPECIMENS.

Place.	No. of samples.	Result.					
		Male.		Female		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Alliance .....	3	.....	2	.....	1	.....	.....
Amsterdam .....	1	1	.....	.....	.....	.....	.....
Athens .....	6	2	2	2	.....	.....	.....
Athens-Lodi .....	1	1	.....	.....	.....	.....	.....
Athens-Waterloo .....	1	.....	.....	1	.....	.....	.....
Baltimore .....	2	2	.....	.....	.....	.....	.....
Batavia .....	3	3	1	2	2	.....	.....
Bellaire .....	1	.....	.....	.....	1	.....	.....
Bluffton .....	1	1	.....	.....	.....	.....	.....
Cadiz .....	1	.....	.....	1	.....	.....	.....
Camden .....	2	.....	1	.....	1	.....	.....
Canton .....	5	2	.....	2	1	.....	.....

## EXAMINATIONS OF DIPHTHERIA SPECIMENS—Continued.

Place.	No. of samples.	Result.					
		Male.		Female		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Chillicothe	5	3		1	1		
Cincinnati	1			1			
Clarksburg	1						1
Columbus	3	2					1
Conneaut	2				2		
Cridersville	1				1		
Custar	1		1				
Defiance-Richland	2	1		1			
Delaware	146	6	7	72	58	2	1
Dexter City	1			1			
Eaton	1		1				
Elyria	11	1	3	4	3		
Franklin-Clinton	1		1				
Franklin-Hamilton	1		1				
Fredericktown	10	3	4		3		
Fremont	1		1				
Gallia	1			1			
Gallia-Gallipolis	1				1		
Gallia-Greenfield	1		1				
Gallia-Raccoon	1			1			
Gallipolis	1	1					
Geauga-Huntsburg	1			1			
Georgetown	1	1					
Germantown	1			1			
Grafton	3	1	1	1			
Grantville	2	2					
Greenville	4	2	1	1			
Guernsey-Oxford	1	1					
Guysville	1					1	
Hamilton	1			1			
Harrison-Stock	1	1					
Haydenville	1			1			
Hillsboro	1				1		
Hocking-Green	1				1		
Iberia	1			1			
Jacksonville	7	4		2	1		
Jackson-Washington	1				1		
Jefferson-Ross	1			1			
Jefferson-Springfield	2		2				
LaGrange	1		1				
Lancaster	2		1	1			
Lawrence-Fayette	1	1					
Lawrence-Union	5	1	1	2	1		
Lawrence-Washington	1			1			
Lebanon	2		2				
Lima	5	1	1	2	1		
Lisbon	1		1				
Logan	6		2	4			
Lorain	2		1		1		
Loveland	6	3	1	2			
Madison-Fairfield	1		1				

## EXAMINATIONS OF DIPHTHERIA SPECIMENS—Continued.

Place.	No. of samples.	Result.					
		Male.		Female.		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Magnolia .....	4	2		2			
Mahoning-Smith .....	1	1					
Malvern .....	3	1		1	1		
Marion .....	4	1		1	2		
Mansfield .....	2			1	1		
Martins Ferry .....	1				1		
McArthur .....	1			1			
Medina .....	1			1			
Mercerville .....	1		1				
Middleport .....	14	2	3	4	4	1	
Minerva .....	1				1		
Minster .....	1			1			
Mt. Gilead .....	1			1			
Mt. Orab .....	1			1			
Mt. Sterling .....	1			1			
Newcomerstown .....	1	1					
New Lexington .....	55	14	6	19	15		1
Niles .....	1				1		
Norwich .....	1		1				
Norwood .....	2		1		1		
Oak Harbor .....	1			1			
Oak Hill .....	2	1		1			
Ostrander .....	1				1		
Perry-Harrison .....	1		1				
Perry-Monroe .....	3	1		1	1		
Perry-Pleasant .....	7	3		4			
Piqua .....	26	9	1	12	3	1	
Pomeroy .....	8	5	1	1	1		
Port Clinton .....	5	1	1	1	2		
Portsmouth .....	2	1			1		
Preble-Israel .....	1		1				
Proctorville .....	1				1		
Ravenna .....	1			1			
Ripley .....	2	1	1				
Ross-Huntington .....	3	1		2			
St. Marys .....	2	1			1		
Sandusky .....	5	3		2			
Selma .....	1					1	
Seven Mile .....	1						1
Shawnee .....	2			2			
Sidney .....	2			1	1		
South Charleston .....	1				1		
South Webster .....	1	1					
Stark-Osnaburg .....	1				1		
Stark-Lawrence .....	1			1			
Tiffin .....	3	1	1	1			
Uhrichsville .....	1	1					
Urbana .....	1				1		
Vinton-Swan .....	2			1	1		
Washington C. H. ....	11	4	3	4			
Waynesburg .....	1		1				

## EXAMINATIONS OF DIPHTHERIA SPECIMENS—Concluded.

Place.	No. of samples.	Result.					
		Male.		Female.		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Wellston .....	5	3	.....	2	.....	.....	.....
West Jefferson .....	1	.....	.....	.....	1	.....	.....
West Union .....	5	.....	4	1	.....	.....	.....
Xenia .....	2	2	1	.....	.....	.....	.....
Zanesville .....	15	3	2	4	6	.....	.....
Total .....	515	111	72	189	132	6	5

## EXAMINATION OF SPECIMENS OF SPUTUM FOR TUBERCLE BACILLI.

Place.	No. of samples.	Result.					
		Male.		Female.		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Adams-Meigs .....	1	1	.....	.....	.....	.....	.....
Akron .....	55	11	13	11	20	.....	.....
Allen-Shawnee .....	1	1	.....	.....	.....	.....	.....
Alliance .....	2	.....	1	.....	1	.....	.....
Amanda .....	1	.....	1	.....	.....	.....	.....
Andover .....	3	.....	2	1	.....	.....	.....
Ansonia .....	1	.....	.....	.....	1	.....	.....
Ashland .....	7	.....	2	1	4	.....	.....
Ashley .....	3	1	.....	1	1	.....	.....
Ashtabula .....	11	.....	4	5	2	.....	.....
Ashtabula-Conneaut .....	1	.....	.....	.....	1	.....	.....
Ashtabula-Wayne .....	1	1	.....	.....	.....	.....	.....
Ashville .....	5	.....	2	.....	2	.....	1
Athens .....	8	1	1	4	2	.....	.....
Athens-Alexander .....	2	.....	.....	2	.....	.....	.....
Athens-Lodi .....	1	.....	1	.....	.....	.....	.....
Athens-Rome .....	2	1	1	.....	.....	.....	.....
Athens-Trimble .....	2	.....	1	.....	1	.....	.....
Athens-Troy .....	2	1	1	.....	.....	.....	.....
Athens-York .....	2	1	.....	.....	1	.....	.....
Attica .....	1	.....	1	.....	.....	.....	.....
Barberton .....	6	.....	2	.....	4	.....	.....
Batavia .....	5	.....	1	1	3	.....	.....



EXAMINATION OF SPECIMENS OF SPUTUM FOR TUBERCLE BACILLI—  
Continued.

Place.	No. of samples.	Result.					
		Male.		Female.		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Bellaire .....	1				1		
Bellevue .....	8		2	1	5		
Bloomingsburg .....	1	1					
Bluffton .....	1				1		
Bolivar .....	1		1				
Bremen .....	1				1		
Bridgeport .....	3	1		2			
Brown-Washington .....	1			1			
Bucyrus .....	24	4	3	5	12		
Butler-Liberty .....	2				2		
Butler-Morgan .....	1			1			
Butler-Union .....	1			1			
Byesville .....	4	1	1	1	1		
Cadiz .....	2			1			1
Caldwell .....	2			1	1		
Caledonia .....	1	1					
Cambridge .....	13	3	1	3	6		
Canal Dover .....	7		3	2	1		1
Canal Winchester .....	2			1	1		
Canton .....	11	1	9		1		
Cardington .....	2	1			1		
Carroll-Lee .....	1		1				
Carrollton .....	1				1		
Celina .....	1	1					
Centerburg .....	1	1					
Chatfield .....	1		1				
Chicago .....	1				1		
Chillicothe .....	10	2	4	1	3		
Circleville .....	4	2	1		1		
Cleveland .....	1	1					
Clinton-Jefferson .....	1				1		
Coal Grove .....	3	1		1	1		
Columbiana .....	1				1		
Columbiana-Butler .....	1				1		
Columbiana-Elk Run .....	1				1		
Columbus .....	26	2	10	6	7		1
Columbus Grove .....	5	2			3		
Conneaut .....	12		3	3	6		
Convoy .....	1				1		
Coshocton .....	4		1		2		1
Coshocton-Washington .....	1				1		
Crawford-Auburn .....	2		1		1		
Crawford-Whetstone .....	1				1		
Crestline .....	3	2			1		
Creston .....	1				1		
Cridersville .....	5		2	2	1		
Crooksville .....	2		1	1			
Curtice .....	1				1		
Cuyahoga Falls .....	3		1		2		
Cuyahoga-Rockport .....	2	1	1				

EXAMINATION OF SPECIMENS OF SPUTUM FOR TUBERCLE BACILLI—  
Continued.

Place.	No. of samples.	Result.					
		Male.		Female		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Cygnets	2			1	1		
Darke-German	2		2				
Darke-Twin	1	1					
Darke-Van Buren	2				2		
Dayton	3				3		
Deavertown	1	1					
Defiance	13	3		6	4		
DeGraff	1			1			
Delaware	41	3	13	9	16		
Delaware-Brown	1		1				
Delaware-Liberty	2	1	1				
Delaware-Orange	2		1		1		
Dennison	3	1		1	1		
Dexter City	1						1
Dunkirk	1					1	
East Liverpool	11		3	6	2		
East Palestine	4	1		2	1		
Eaton	1			1			
Edgerton	1	1					
Eldorado	1		1				
Elida	3			2	1		
Elyria	5	3		1	1		
Fairfield-Greenfield	1			1			
Fairport Harbor	3	1	2				
Farmersville	1		1				
Findlay	1	1					
Fletcher	1	1					
Flushing	1		1				
Fostoria	6	1		3	2		
Franklin-Marion	1		1				
Franklin-Prarie	1	1					
Fredericksburg	1				1		
Fremont	4		1		3		
Gahanna	1			1			
Galion	5	1	3		1		
Gallia-Cheshire	1				1		
Gallia-Springfield	1	1					
Geneva	1	1					
Georgetown	3		3				
Ghent	3	1			2		
Gilboa	2		1	1			
Glandorf	1			1			
Glouster	1				1		
Gordon	1				1		
Grafton	3	1	1		1		
Granville	2				2		
Greenfield	3			1	2		
Greenford	1					1	
Greenville	1	2			5		
Greenwich	3		1		2		

EXAMINATION OF SPECIMENS OF SPUTUM FOR TUBERCLE BACILLI—  
Continued.

Place.	No. of samples.	Result.					
		Male.		Female.		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Grover Hill	4			3	1		
Guernsey-Madison	1			1			
Guernsey-Wills	1		1				
Hamilton	4	2	2				
Hanging Rock	3		1		2		
Hanover	1		1				
Harrison-German	1				1		
Haviland	2				2		
Highland-Washington	1	1					
Hillsboro	1		1				
Hiram	1			1			
Hocking-Ward	1				1		
Holgate	1			1			
Holmes-Ripley	1				1		
Hubbard	2				2		
Huntington	2	2					
Huntsville	3			1	2		
Irondale	1		1				
Ironton	11	4	3	3	1		
Jackson	4				4		
Jackson Center	3	1	1		1		
Jeromesville	1		1				
Junction City	4	2	1		1		
Kent	2		1	1			
Lafayette	1	1					
Lakeside	1	1					
Latty	1			1			
Lakewood	1	1					
Lancaster	1				1		
Lawrence-Lawrence	1			1			
Lawrence-Perry	1			1			
Lawrence-Union	4		2		2		
Lebanon	12	4	4	1	3		
Leetonia	1				1		
Leipsic	1	1					
Lexington	1	1					
Lima	9	2		3	2		2
Lindsey	1				1		
Lisbon	5			3	1	1	
Lodi	1		1				
Logan	1		1				
London	7	1	1	2	3		
Lorain	3	2	1				
Loveland	1			1			
Lucas-Jerusalem	1	1					
Madison	6		4		2		
Magnolia	6	2		1	3		
Malvern	3	1	2				
Mansfield	14		4	3	7		
Marietta	3	2			1		

EXAMINATION OF SPECIMENS OF SPUTUM FOR TUBERCLE BACILLI—  
Continued.

Place.	No. of samples.	Result.					
		Male.		Female.		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Marion .....	4	1		1	2		
Martins Ferry .....	2				2		
Marysville .....	9	2		3	4		
McArthur .....	7	2			5		
McComb .....	1			1			
McConnelsville .....	1		1				
Medina .....	1		1				
Medina-Homer .....	1				1		
Medina-Sharon .....	1		1				
Mentor .....	1			1			
Middleport .....	2		1		1		
Middletown .....	3		1	1	1		
Miffln .....	1				1		
Monroeville .....	1		1				
Montgomery-Madison .....	4		2	1	1		
Montgomery-Mad River .....	1			1			
Morgan-Deerfield .....	1	1					
Morrow-Washington .....	3		2				
Mt. Cory .....	2			2			
Mt. Gilead .....	4		1	1	2		
Mt. Sterling .....	2	1	1				
Mt. Vernon .....	15	5	4	3	3		
Moxahala .....	2		1		1		
Muskingum-Perry .....	1				1		
Napoleon .....	1			1			
Nelsonville .....	1		1				
Newark .....	14	2	2	4	5		1
New Athens .....	1		1				
New Concord .....	4	1	1	1	1		
Newcomerstown .....	1		1				
New Lexington .....	12	1	3	4	4		
New Matamoras .....	4			4			
New Paris .....	1				1		
New Philadelphia .....	3	1	1	1			
Newton Falls .....	1				1		
New Washington .....	2			1			1
Niles .....	3			2	1		
North Lewisburg .....	1		1				
Norwalk .....	3	1	1		1		
Norwood .....	3	2	1				
Oak Harbor .....	10	1	1	1	7		
Oberlin .....	4		2	1	1		
Oregonia .....	1				1		
Osnaburg .....	2				2		
Ostrander .....	1				1		
Ottawa .....	1			1			
Ottawa-Allen .....	1	1					
Painesville .....	7	2	3	1	1		
Paulding .....	6		1	2	3		
Paulding-Jackson .....	1				1		

EXAMINATION OF SPECIMENS OF SPUTUM FOR TUBERCLE BACILLI—  
Continued.

Place.	No. of samples.	Result.					
		Male.		Female		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Paulding-Latty	1	1					
Paulding-Paulding	1	1					
Payne	2				2		
Perry-Harrison	1		1				
Perry-Pleasant	3			2	1		
Pickerington	1			1			
Piedmont	1		1				
Pike-Jackson	2		2				
Piketon	2		1	1			
Piqua	6	1	1	2	2		
Portage-Randolph	1				1		
Port Clinton	4	1	2		1		
Portsmouth	13	3	2	2	6		
Port Washington	1				1		
Proctorville	1			1			
Prospect	1				1		
Putnam-Ottawa	1			1			
Richland-Weller	1		1				
Richwood	2		1		1		
Rockford	1				1		
Rome	1		1				
Ross-Franklin	1			1			
Russellville	2		1		1		
Saint Paris	1			1			
Salem	15	2	8	3	2		
Sandusky	10		3		7		
Sardinia	1				1		
Savannah	2	1			1		
Seneca-Pleasant	2		1		1		
Shawnee	2			1	1		
Shelby	2		1		1		
Shelby-Salem	1		1				
Sidney	2	1	1				
Somerset	1				1		
South Akron	2		1	1			
Sparta	1		1				
Specht	1			1			
Spencerville	9	3	1	3	2		
Stark-Osnaburg	1				1		
Stark-Pike	2	1			1		
Steubenville	3	1		2			
Stewart	1			1			
Strasburg	1	1					
Stryker	1	1					
Sugar Creek	2				2		
Sugar Grove	2			2			
Summit-Bath	1				1		
Summit-Copley	1				1		
Summit-Richfield	1			1			



EXAMINATION OF SPECIMENS OF SPUTUM FOR TUBERCLE BACILLI—  
Concluded.

Place.	No. of samples.	Result.					
		Male.		Female.		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Sunbury .....	2			2			
Tiffin .....	8	2	3		3		
Tippecanoe .....	1			1			
Tiro .....	2	2					
Toledo .....	12			2			
Trimble .....	1				1		
Trotwood .....	1	1					
Trumbull-Fowler .....	1			1			
Trumbull-Kinsman .....	2		1	1			
Tuscarawas .....	2				2		
Tuscarawas-Wayne .....	1	1					
Tuscarawas-York .....	1		1				
Uhrichsville .....	9	1	4	3	1		
Union-Union .....	2		2				
Urbana .....	1				1		
Utica .....	2		1		1		
Vinton-Harrison .....	1				1		
Warren-Washington .....	2			2			
Warsaw .....	1				1		
Washington-Aurelius .....	1	1					
Washington C. H. ....	1		1				
Washington-Fairfield .....	1			1			
Waverly .....	3			2	1		
Waynesburg .....	1			1			
Wellington .....	4	1			2		1
Wellston .....	1				1		
West Alexandria .....	6		1		5		
West Jefferson .....	3	1	1		1		
West Mansfield .....	2				1		1
West Union .....	1	1					
Williams-Pulaski .....	1			1			
Woodstock .....	1				1		
Yorkshire .....	1		1				
Youngstown .....	2		1	1			
Zaleski .....	1		1				
Zanesville .....	31	6	5	9	11		
Total .....	994	165	244	221	349	3	12

## EXAMINATIONS OF TYPHOID SPECIMENS.

Place.	No. of samples.	Result.					
		Male.		Female.		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Akron .....	29	12	6	6	5		
Alliance .....	5	3		1	1		
Ashtabula .....	1			1			
Ashtabula-Austinburg .....	2			1	1		
Barberton .....	4		1	2	1		
Bellaire .....	4	2		2			
Botkins .....	1			1			
Chillicothe .....	2	1		1			
Columbus Grove .....	1			1			
Conneaut .....	1	1					
Creston .....	6	3	1	2			
Defiance .....	5	4	1				
Delaware .....	1				1		
Dell Roy .....	1		1				
Delphos .....	3	3					
Eaton .....	2		1	1			
Franklin-Jefferson .....	1			1			
Fremont .....	3	1	1	1			
Fort Jennings .....	1				1		
Galion .....	2	1			1		
Greenfield .....	11	3	5	2	1		
Hamden Junction .....	3	2			1		
Hamilton-Symmes .....	1		1				
Huron .....	1	1					
Ironton .....	1			1			
Jackson .....	2	2					
Jefferson .....	3	1	2				
Kellys Island .....	2	1			1		
Kenton .....	4	1	1	2			
Licking-Lima .....	2	2					
London .....	2	2					
Magnolia .....	3	1			2		
Mansfield .....	5		2	2	1		
Marion .....	1					1	
Martins Ferry .....	6	3	2	1			
McArthur .....	1		1				
Medina .....	3	2		1			
Middletown .....	1		1				
Mt. Vernon .....	1				1		
Newark .....	1	1					
New Berlin .....	2	2					
New Paris .....	1				1		
New Lexington .....	1	1					
Painesville .....	1		1				
Piketon .....	1			1			
Piqua .....	1	1					
Plain City .....	1			1			
Portsmouth .....	3	3					
Rockwood .....	1	1					
Sandusky .....	2	1		1			
Sandusky-Jackson .....	1		1				

## EXAMINATIONS OF TYPHOID SPECIMENS — Concluded.

Place.	No. of samples.	Result.					
		Male.		Female.		Sex not stated.	
		Positive.	Negative.	Positive.	Negative.	Positive.	Negative.
Seneca-Pleasant .....	1	.....	1	.....	.....	.....	.....
Sidney .....	1	.....	1	.....	.....	.....	.....
Stark-Plain .....	1	.....	.....	1	.....	.....	.....
Summit-Bath .....	2	1	.....	1	.....	.....	.....
Vinton-Clinton .....	3	1	.....	2	.....	.....	.....
Washington C. H. ....	1	.....	.....	.....	.....	.....	1
Waverly .....	3	1	.....	.....	2	.....	.....
Wellston .....	1	1	.....	.....	.....	.....	.....
Zaleski .....	1	1	.....	.....	.....	.....	.....
Zanesville .....	3	1	.....	2	.....	.....	.....
Total .....	161	68	31	39	21	1	1

## MISCELLANEOUS EXAMINATIONS.

Lab'y No.	Place.	No. of Sam- ples.	Nature of sample.	Examined for	Remarks.
262	Ashland	1	Dog	Rabies	Negative.
228, 250	Barnesville	2	Dogs	Rabies	One positive, one negative.
264	Beallsville	1	Dog	Rabies	Negative.
276	Berne	1	Dog	Rabies	Positive.
230	Cambridge	1	Dog	Rabies	Positive.
254, 255	Canton	1	Milk	Adulteration	Not adulterated.
265	Canton	1	Dog	Rabies	Positive.
251	Chesterville	1	Urine	Diazo reaction	Positive.
248	Chillicothe	1	Dog	Rabies	Suspicious.
233	Columbus	79	Air	Purity	See Special Report.
277	Conneaut	1	Dog	Rabies	Positive.
271	Croton	1	Dog	Rabies	Positive.
274	Cygnat	1	Dog	Rabies	Negative.
226, 229	Dayton	2	Dogs	Rabies	Positive.
243	Dennison	1	Water	Acidity	Negative.
252	Dennison	1	Dog	Rabies	Negative.
222	East Palestine	1	Pleuritic effu- sion	Rabies	Negative.
275	Elmore	1	Dog	Tubercle bacilli	Negative.
263	Elyria	1	Sand	Rabies	Positive.
241	Fostoria	1	Dog	Solubility	Insoluble in water.
227, 249	Fremont	2	Dogs	Rabies	Negative.
244, 245	Geneva	2	Alum	Rabies	One positive, one negative.
238	Jeromesville	1	Dog	Rabies	Positive.
234	Knox-Union	1	Dog	Rabies	Positive.
253	Lancaster	1	Dog	Rabies	Positive.
269	Logan (Hocking Co. In- firm and Children's Home)				
	London	1	Dog	Rabies	Negative.
261		1	Dog	Rabies	Suspicious.

## MISCELLANEOUS EXAMINATIONS—Concluded.

Lab'y No.	Place.	No. of Sam- ples.	Nature of sample.	Examined for	Remarks.
267	Lorain .....	1	Dog .....	Rabies .....	Negative.
282	Mansfield (Ohio State Re- formatory) .....	1	Pus .....	Tubercle bacilli .....	Negative.
268	Mansfield .....	1	Milk .....	Adulteration .....	Not adulterated. One normal lymph gland, 1 piece small bone, 1 piece inspissated fecal matter.
223-225	Miami-Elizabeth .....	3	Post-mortem ..	Description .....	Good.
253	Minerva .....	1	Ham .....	Quality .....	Negative.
286	New Lexington .....	1	Finger .....	Anthrax .....	Positive.
247	New Lexington .....	1	Dog .....	Rabies .....	Fair.
237	North Lewisburg .....	1	Ice .....	Quality .....	Negative.
266	Pickerington .....	1	Pus .....	Tubercle bacilli .....	Negative.
246	Salem .....	1	Corned beef....	Poisonous matter ..	Positive.
231	Sarahsville .....	1	Dog .....	Rabies .....	Three positive, 1 negative, 1 not examined.
289, 242, 256,	Toledo .....	5	Dogs .....	Rabies .....	One positive, 1 negative.
260, 272	Toledo .....	2	Cats .....	Rabies .....	Positive.
257, 258	Washington-Newport ..	1	Dog .....	Rabies .....	Negative.
273	Washingtonville .....	1	Feces .....	Anchylostoma duo- denale .....	Positive.
240	Washingtonville .....	1	Feces .....	Anchylostoma duo- denale .....	Negative.
270	Waterville .....	1	Dog .....	Rabies .....	Positive.
235	Waverly .....	1	Dog .....	Rabies .....	Positive.
Total .....		133			



## CO-OPERATIVE WORK WITH THE UNITED STATES GEOLOGICAL SURVEY.

In the co-operative work with the U. S. G. S., 204 samples of sewage, manufacturing wastes, and waters from various streams were examined. The results are given elsewhere in a special report.

## EFFICIENCY OF FILTRATION IN PUBLIC WATER SUPPLIES.

In investigating the efficiency of filtration in public water supplies 855 samples have been examined. The results will be found in a special report.

## PRESENT WATER SUPPLIES.

Seventy-one samples collected from various existing public supplies were examined. The results will be given in a special report.

## SPECIAL SEWAGE.

In the study of the efficiency of sewage disposal plants of the state 239 samples were examined. The results will be given in a special report.

## EXAMINATIONS OF WATERS.

## REPORT OF EXAMINATIONS OF SAMPLES OF WATER PROPOSED AS PUBLIC WATER SUPPLIES.

The analytical results of samples from sources proposed for public supplies or as additions to existing supplies, together with extracts from the report of the bacteriologist and chemist, are given for the various cities and villages considered during the year 1906. For complete information see Report on Proposed Public Water Supplies.

## EXAMINATION OF WATER FROM AKRON. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4763	Dec. 28, '05.	10	80	distinct	ft. earthy	.048	.044	.002	none
4797	Jan. 17. ...	20	15	slight	ft. earthy	.064	.060	.004	none
4810	Jan. 31.....	20	15	slight	trace	.034	.042	none	none
4811	Jan. 31....	20	30	distinct	trace	.036	.008	none	none

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
4763	2.65	3.2	299	114	.5	609	53	130	no
4797	1.46	4.5	292	86	.9	662	40	15	no
4810	.95	3.8	297	71	1.2	488	44	15	no
4811	1.47	4.6	248	107	1.0	497	46	22	no

Sample No. 4763. Driven well No. 33. The results indicate a ground water comparatively free from fresh or past organic pollution. The water is rather hard and contains more sludge forming material and more scale than does the present supply derived chiefly from Summit Lake. The present sample is, of course, much lower in chlorides than the lake water because it is not subject to the same mineral pollution. The water contains a little iron and in addition some suspended soil. Although the turbidity is not excessive, yet, it is sufficient in amount to cause some minor complaint. The analysis indicates a water that would be classed as usable for a public supply, but open to minor objections on account of hardness and turbidity.

Samples 4797 and 4810. Well No. 3. The results indicate a ground water of sufficient purity to class it as potable. It is considerably harder than the present supply from Summit Lake, but is vastly superior on account of its freedom from organic pollution. The water is also higher in iron and there is consequently a turbidity and sediment that may lead to minor complaints.

Sample No. 4811. Well No. 26. This water is in general much like the preceding. The present sample shows a little different adjustment of the hardness, having a little less alkalinity and a little more incrustants or scale forming material. The analyses show that the ground waters are desirable for a public supply as regards their freedom from organic pollution of either vegetable or animal nature, but they are open to minor complaint on account of hardness and the presence of some iron.

## STATE BOARD OF HEALTH.

## EXAMINATION OF WATER FROM CANAL FULTON. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4801	Jan. 19 ...	10	none	none	trace	.016	none	none	2.0
4802	Jan. 19 ....	none	none	none	none	.010	trace	none	6.0

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
4801	.56	4.3	107	16	.4	154	13	600	no
4802	.31	13.8	176	32	.3	323	65	325	no

Sample No. 4801. Tap at hotel. The results indicate a sub-soil ground water of good quality for a public supply because it is practically free from fresh organic matter, is soft and shows only a very small amount of nitrates and chlorides. Comparison of the present sample with No. 2272 proposed as a supply in June, 1902, shows this water is much like the sample then furnished. One would infer from the analysis that most of the water in use at the time of sampling came from the spring rather than from the well.

Sample No. 4802. Well on top of a hill near a farm house west of the village and furnishing part of the public supply. This sample indicates a sub-soil ground water practically free from fresh organic pollution, moderately soft but showing in its nitrates and chlorides some influence from a sewage source such as might be expected from the neighboring privy. The water is usable, but the analysis indicates the advisability of removing the neighboring sources of sewage pollution.

## EXAMINATION OF WATER FROM CROOKSVILLE. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4854	Mar. 29....	20	160	distinct	none	.222	.034	.004	2.0

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
4854	3.51	2.3	35	19	1.5	246	43	2200	in 1cc

Sample No. 4854. Jonathan's Creek at Powell's Mill. The results indicate a surface water somewhat displeasing in appearance, containing vegetable pollution and evidences of a minor sewage pollution. In the untreated state it would not be looked upon as of suitable quality for a public supply.

## EXAMINATION OF WATER FROM GARRETTSVILLE. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
5302	July 12...	25	40	decided	none	.010	.004	trace	trace

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
5302	.81	2.7	68	4	2.0	189	.....	80	no

Sample No. 5302. Wells No. 5 and No. 7 of the proposed supply. The results show a soft ground water that is also free from organic pollution. Accordingly it is a desirable water for a public supply. However, there is one objection to this water and that is the amount of iron that it contains. This iron causes the water to be displeasing in appearance and will doubtless give rise to some complaints on account of its staining properties on wash bowl and bath room fixtures.

#### EXAMINATION OF WATER FROM IRONTON. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4873	April 4....	20	500	decided	trace	.050	1.540	trace	none
4889	April 13...	10	500	very dec.	none	.060	1.380	none	none
4676	May 27....	20	80	decided	none	.050	.524	trace	none
4986	May 30....	10	none	trace	none	.082	.018	none	trace
5006	June 3....	12	160	decided	none	.052	.384	.006	none
5021	June 6....	20	100	distinct	none	.044	.050	.002	none
5068	June 9....	trace	trace	trace	none	.056	.020	.001	none
5083	June 12...	10	10	trace	faint	.010	.016	.002	none





Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
5451	.72	7.6	162	61	trace	283	115	1700	no
5939	1.69	12.2	88	27	1.0	201	75	11000	no
6117	3.95	18.0	51	18	.5	980			
6118	.96	9.4	64	32	trace	196			
6120								11300	no
6121								600	no
6127			32	75				110	no
6128			35	40				2600	no

Sample No. 4873. Ten-inch drilled well located between Ice Creek and a soap factory. The results show a water that is comparatively free from fresh organic pollution and is a satisfactory water bacterially besides being soft. The water is for some reason unusually high in free ammonia. The great objection to this water is the very large amount of iron that it contains. There is so much iron present that the water is unusually turbid and gives a marked deposit on standing. In consequence of this appearance and deposit, the water is quite unfit for a public supply unless steps are taken to remove the iron.

Sample No. 4889. From same source as No. 4873. The results are in general the same as those obtained in sample No. 4873, except there has been some increase in chlorides. The iron has decreased, but it is still so excessive as to make the water in the untreated state quite unsuitable for a public supply.

Samples 4976, 4986, 5006, 5021, 5068 and 5083. Shallow wells in the Ohio River. The results show that the search has been successful in obtaining waters free from the large amounts of iron that previous samples have shown. Some of the present samples show considerable hardness. Especially No. 5021 collected June 6th, and 5068 collected June 9th. None of the waters were high in organic matter, but samples Nos. 4976 and 5006, collected May 27th and June 3d, indicate by their free ammonia a different influence than the other samples. Three of the present samples show considerable turbidity, namely, Nos. 4976, 5006 and 5021, collected May 27th, June 3d and June 6th, respectively. From the foregoing analyses it would appear that the pleasing waters as regards appearance would be Nos. 4986, 5068 and 5083, and of these the first and third collected, respectively, on May 30th and June 12th, are among the softer waters. From the character of the waters as shown

by the above analyses it would appear that the most desirable samples among these usable waters are Nos. 4986 and 5083.

Sample No. 5451. Driven well at Camden Interstate Railway Company's street car barn. The analysis shows a water of good appearance and with chemical evidences of freedom from organic pollution. There is a slight amount of past pollution influence. The water is only a moderately hard one for a ground water, although harder than the Ohio River water. The sample shows only a trace of iron. The number of bacteria is higher than would usually be expected from a good driven well. The analysis indicates a usable water, but before it is accepted for a public supply the question of the possibility of a greater amount of pollution from the neighboring sources should be investigated.

Sample No. 5938. Ohio River. The analysis is such as might be obtained at almost any time from the Ohio River at this point. It indicates a water that is not satisfactory in its present condition for a public supply. It is open to objection in several directions.

Sample No. 5959. Fifteen foot well in sand and gravel bar in bed of Ohio River. The analysis reveals a water containing more organic matter than a good ground water or a good filtered water should, as will be seen from various determinations in the analysis. It is possible that these findings would improve after continued usage so that the organic matter in the sand nearest the well would have a chance to be removed. The water does not contain as much sediment nor as much iron as does the river water. On the other hand, the alkalinity and in-crustants are higher than the river water, but do not show as great an increase in hardness over the river water as do most of those waters taken from the river beds or vicinity. In other words, the present sample indicates a partially filtered river water with less ground water than is usually obtained in wells of like location. While the water might be classed as usable, yet it would be desirable to have it of slightly better character for a public supply.

Sample No. 6117 and 6120. Ohio River water in the vicinity of the 10-inch crib. The analyses indicate such a water as might be expected from the Ohio River at almost any time. Intestinal bacteria were not present at the time of sampling, but they frequently are as shown by previous samples from this location. It is not a suitable water in the untreated state for a public supply.

Sample No. 6118 and 6121. Ten-inch crib or well at pump discharge. The results indicate a water of pleasing appearance practically free from evidences of fresh organic pollution. A comparison of the mineral properties shows that the water obtained from the crib is only in part river water. The number of bacteria is a little higher than desirable for a public supply, but it is possible that this finding would decrease with further pumping. The analysis indicates a suitable water for a public supply, provided the water will maintain the character shown in the present sample.

Sample No. 6127 from the crib is clear, and shows a decided improvement in the reduced number of bacteria as compared with the sample (6121) collected on the 7th inst. This bacterial examination added to the examination of samples 6118 and 6121 show a satisfactory water for a public supply as regards freedom from organic pollution. It will be noticed that the present crib sample shows a 50 per cent. increase in hardness over the corresponding sample of a week ago, but the hardness is still much less than most of the Ohio ground waters, although considerably harder than the river water.

Sample No. 6128 from the Ohio River needs no comment.

## EXAMINATION OF WATER FROM LEESBURG. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4435	July 12, '05.	...	none	none	none	.016	.024	...	none
4472	July 25, '05	...	...	...	...	...	...	none	.2
4478	July 31, '05.	trace	none	trace	none	.008	.010	none	.2
4767	Dec. 28, '05.	trace	none	none	trace	.014	.010	none	5.0

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
4435	.....	5.8	327	8	.....	.....	.....	.....	.....
4472	.....	.....	.....	.....	.....	.....	.....	100	no
4478	.53	1.5	313	13	.35	354	72	275	no
4767	.57	5.1	265	26	.8	364	85	1800	no

Sample No. 4435 from Dewey Mill well. The results obtained were not sufficient to warrant an opinion.

Sample No. 4472 and 4478. From a spring about one mile west of the village and one-fourth mile south of B. & O. S. W. R. R. The

chemical and bacteriological results indicate a water of good quality as regards freedom from organic pollution, and while the water is hard, yet it will be noticed that the amount of scale forming material as shown by the incrustants is small. The analysis indicates a suitable water for a public supply.

Sample No. 4767, from a drilled well 154 feet deep. The results indicate a ground water showing the characteristics of a good sub-soil water practically free from fresh organic pollution. The nitrates and chlorides would indicate a small amount of "past pollution" influence which is not a desirable feature if the polluting source is near at hand. The water is moderately hard but not as hard as many of the ground waters of the state. It contains a little iron which may grow less as the well is used. The number of bacteria is rather high, but in view of the other findings is not so significant in this case. A comparison with samples No. 4472 and 4478 indicates that the present water is of much the same general character as that submitted last summer, but on the whole a trifle inferior in quality.

#### EXAMINATION OF WATER FROM LEETONIA. PROPOSED ADDITIONAL SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4719	Nov. 14, '05.	trace	500	distinct	faint	.018	.270	trace	none
4720	Nov. 14, '05.	5	none	none	trace	.018	.312	none	none
4750	Dec. 16, '05.	10	none	none	none	.008	.310	.002	none

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
4719	7.01	trace	321	none	3.0	647	45	900	no
4720	.52	.5	314	none	.7	388	32	650	no
4750	.30	1.8	301	2	.4	399	38	4	no



Sample No. 4719. Drilled well No. 1, 256 feet deep. The results show that this water contains considerable iron and other sediment, making it a displeasing water in appearance. Some of the findings for organic matter are doubtless increased by the presence of organic material with the suspended matter. The absence of intestinal bacteria with some of the chemical findings indicates that this water is free from sewage pollution. Aside from the undesirable features noted above, it would be a usable water, but with those present it would not make a satisfactory addition to the present supply.

Sample No. 4720. Drilled well No. 2, 202 feet deep. The results indicate a deep ground water of sufficient purity to class it as a good water for an addition to the present supply. In character it is much like the present supply when examined in October, 1900.

Sample No. 4750. Deep driven well No. 1. The bacteriological and chemical findings indicate a suitable water for addition to a public supply, but it is to be noticed that the water is harder than would be desired on account of the present supply being a comparatively soft one. However, this proposed addition is not as hard as many other public supplies now in use in this state.

# EXAMINATION OF WATER FROM MEDINA. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
5282	July 9. . . . .	12 (*)	35 (*)	trace (*)	none (*)	.251 (*)	.069 (*)	trace ( )	none (')
5283	July 9. . . . .	10	none	none	none	...	...	trace	none
5284	July 9. . . . .	...	...	...	...	...	...	...	...
5296	July 11. . . . .	...	...	...	...	...	...	...	...
5297	July 11. . . . .	...	...	...	...	...	...	...	...
5298	...	...	...	...	...	...	...	...	...
5299	...	...	...	...	...	...	...	...	...

\* Chemical findings on combined samples Nos. 5282 and 5284.



Samples Nos. 5282, 5284, 5296, 5298 and 5319 from Rocky River stream. These samples indicate a stream water of only moderate hardness, but it contains enough organic matter so that it would not make a suitable source for a public supply at all times. It will be noticed that intestinal bacteria were only found in one of the samples and that the number of bacteria does not indicate a great fluctuation during the period covered by the present samples.

Samples Nos. 5283, 5297, 5299 and 5317. Gravel bed samples. River water after natural filtration. As would be expected, these samples show a decreased amount of organic matter from that obtained in the unfiltered river water. The number of bacteria is also less in part of the samples, but shows some variation. The absence of intestinal bacteria together with the chemical findings would indicate a usable water at the time of sampling. If this quality were to be maintained under all circumstances it would be a usable water for a public supply.

Sample No. 5318. The number of bacteria from the stream ejection pump is not what would be expected and suggests the possibility of accidental contamination.

# EXAMINATION OF WATER FROM PLYMOUTH. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4845	March 27..	20	none	none	none	.204	.012	trace	trace

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
4845	2.48	9.8	198	47	.8	385	47	104	no

Sample No. 4845. Dug well east of the pumping station. The results indicate a ground water free from fresh sewage pollution but containing evidences of a little vegetative organic matter. The water is somewhat similar to sample No. 2147 examined in April, 1902, from a drilled well proposed as a supply for Plymouth. The present sample is an improvement over No. 2147 in some respects, and especially in being somewhat softer and containing less iron. The present sample would be classed as a usable one for a public supply, although there are minor features that might be slightly improved.

# EXAMINATION OF WATER FROM STEUBENVILLE. PROPOSED ADDITIONAL SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4831	Feb. 23	trace	none	mere tr.	none	.042	trace	trace	trace

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
4831	.45	15.9	20	72	.3	196	42	150	in 1cc

Sample No. 4831. John Mackey spring. The results indicate a water of good appearance, free from organic pollution and soft. There is some indication of a remote influence from sewage source and for some reason intestinal bacteria were present in the water at the time of sampling. The rest of the analysis would lead us to expect that under good conditions of protection from surface pollution that intestinal bacteria should not be present.

## EXAMINATION OF WATER FROM WAUSEON. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4952	May 15...	5	none	none	none	.030	.008	none	none
4953	May 15....	15	trace	very sl.	none	.194	.044	.010	none
4954	May 15 ..	30	trace	very sl.	trace	.252	.048	.016	1.0
4955	May 15... none	trace	very sl.	trace	trace	.090	.320	none	none
4972	May 23... 15	10	very sl.	faint		.044	.304	none	trace
4973	May 23.... 10	trace	trace	trace		.044	.294	none	none
4974	May 23 ... 15	10	very sl.	trace		.038	.308	none	trace
4975	May 23.... 25	10	very sl.	trace		.066	.310	none	none

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
4952	.45	1.3	125	1	.7	175	16	9000	no
4953	4.43	1.5	167	24	.7	284	49	2600	in 1cc
4954	5.68	1.3	163	20	.7	274	52	3400	in 1cc
4955	1.08	230.0	373	none	.9	862	92	65	no
4972	.84	23.0	294	none	1.1	439	93	6	no
4973	.66	23.2	297	none	.7	401	86	9	no
4974	.55	29.0	295	none	.9	397	75	5	no
4975	.65	41.0	279	none	1.3	437	52	1	no

Sample No. 4952. Cook's Spring. The number of bacteria in this sample is quite high, and is not in keeping with the other determinations which would indicate the possibility of its being accidental. The absence of intestinal bacteria together with all the chemical findings indicate a soft water of good quality, and therefore desirable for a public supply.

Sample No. 4953. Cook's Spring. Branch. The results still show a soft water, although slightly harder than the preceding one, but there has been a marked increase in the organic matter. Intestinal bacteria were present. The water in its present state would not be looked upon as suitable for a public supply.

Sample No. 4954. North Branch Brushy Creek. This water is in



the same class with No. 4953, showing evidences of organic pollution of both vegetative and animal nature.

Sample No. 4955. Tap water now in use. The results indicate a ground water showing only a comparatively small amount of organic pollution. The water is high in mineral matter, especially in chlorides, and is not to be looked upon as a desirable water for a public supply, although it is a usable one. The low number of bacteria and the absence of intestinal bacteria show that the water is not receiving sewage influence.

Samples Nos. 4972-4975. Flowing wells. In general these well waters are similar, although there is a variation in some of the analytical findings. They do not show the influence from salt that is shown in the water now in use. Like the present water they do not contain incrustants. The amount of iron is a trifle higher than in the present water. None of these samples contain intestinal bacteria, and in all of them the number of bacteria was very low. These waters would be classed as usable for a public supply, although they contain minor undesirable features.

### EXAMINATION OF WATER FROM WEST MILTON. PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
4769	Dec. 29..	trace	none	none	trace	.020	none	none	6.0
5233	July 6.....	none	none	none	none	.018	trace	none	8.0

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
4769	.56	3.6	230	14	.2	319	92	1300	no
5233	.25	.5	233	5	none	329	110	250	no

Sample No. 4769. Tap at the pumping station. The number of bacteria is considerably higher than would be expected from a good spring. The absence of intestinal bacteria, on the one hand, and on the other, the satisfactory chemical findings for those determinations indicative of the presence of fresh organic pollution show that the water is a good one as regards its freedom from fresh pollution. The nitrates and chlorides would indicate a slight influence from some privy vault or stable, but nature has thus far given proper purification. But the findings indicate the advisability of removing such a possible source of pollution. The water is moderately hard, but still softer than many of the ground waters of the state. Although this is a different spring than the Vore spring from which sample No. 2554 was examined in October, 1902, as a proposed supply, yet, it is somewhat of the same character, although higher in mineral properties.

Sample No. 5233. Pumping station. The analysis indicates a ground water that is softer than many of the ground waters of the state and one that is free from fresh organic pollution. Comparison with previous samples examined from West Milton in October, 1902, and January, 1906, show that the water is improved in freedom from organic matter, and as regards the number of bacteria. The present sample is higher in nitrates than either of the preceding ones, but the chlorides are low. The water is of pleasing appearance, and one that in its present state is suitable for a public supply.

#### EXAMINATION OF WATER FROM WOOSTER. PRELIMINARY TO PROPOSED SUPPLY.

PARTS PER MILLION.

Sample Number.	Collected.	Color.	Turbidity.	Sediment.	Odor.	Nitrogen as			
						Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.
5032	June 7. . . .	20	trace	trace	none	.104	.670	none	none
5033	June 7. . . . .	30	35.	distinct	none	.046	.474	none	none

Sample Number.	Oxygen Required.	Chlorine.	Alkalinity.	Incrustants.	Iron.	Residue on Evaporation.		Bacteria.	
						Total.	Loss on Ignition.	Number per cc.	Colon Present in 50cc.
5032	1.36	182.8	231	none	.3	583	61	18,000	no
5033	1.21	266.1	244	205	.0	1165	60	6800	no

Sample No. 5032. "No. 1. Well 120 feet deep. South of town near Apple Creek." The results show considerable organic matter and high amount of chlorine and a very high number of bacteria for a drilled well. These results are not such as would class the water as wholly satisfactory for a public supply.

Sample No. 5033. "No. 2. Well 60 feet deep." This well also shows some organic matter, is even higher in salt influence than the preceding sample. In addition, it is a much harder water, containing a marked amount of scale forming material. The number of bacteria here is also high. The above results are not such as to class the water as a satisfactory one for a public supply.

EXAMINATIONS OF MISCEL-  
LANEOUS WATERS.

(425)

## EXAMINATIONS OF MISCELLANEOUS WATERS

PARTS PER

Sample Number.	Place.	Date col- lected.	Source of sample.	Cause for Examination.	Color.	Turbidity.	Sediment.	Odor.
		Month. Day.						
4827	Albany	2 20	Dug well	Typhoid	trace	none	none	trace
4828	Albany	2 20	Dug well	Typhoid	10	none	none	trace
4829	Albany	2 20	Well	Typhoid	5	none	none	trace
5842	Allen-Jackson	10 3	Drilled well	Quality	.....	slight	distinct	faint earthy
6297	Allen-Marion	12 20	Dug well	School	.....	trace	trace	faint
4960	Archbold	5 19	Drilled well	Typhoid	.....	trace	slight	medicinal
4821	Ashtabula	2 15	Spring	Quality	trace	none	none	none
4822	Ashtabula	2 15	Spring	Quality	trace	none	none	none
4828	Ashtabula	2 15	Spring	Quality	12	none	none	none
4824	Ashtabula	2 15	Spring	Quality	.....	.....	.....	.....
4888	Ashtabula	4 12	Spring	Typhoid	.....	.....	.....	.....
5803	Ashville	9 25	Dug well	Typhoid	trace	trace	slight	none
6288	Athens-Athens	12 18	Dug well	Typhoid	.....	none	trace	trace
5802	Augusta	9 24	Spring	Typhoid	none	none	none	none
4795	Barberton	1 17	Creek	Pollution	30	40	distinct	sewage
4886	Barberton	4 10	Driven well	Typhoid	.....	.....	.....	faint earthy
5695	Barberton	9 12	Dug well	Typhoid	trace	5	trace	none
4891	Bellaire	4 23	Dug well	School	none	none	none	none
5958	Bellaire	10 18	Spring	School	.....	trace	trace	none
6291	Bellaire	12 20	Drilled well	Quality	.....	trace	trace	peculiar
6292	Bellaire	12 20	Drilled well	Quality	.....	trace	trace	none
6293	Bellaire	12 20	Drilled well	Quality	.....	none	none	putrefactive
6291	Bellaire	12 20	Drilled well	Quality	.....	10	trace	none
6295	Bellaire	12 20	Drilled well	Quality	.....	none	none	none
6296	Bellaire	12 20	Drilled well	Quality	.....	none	none	none
5662	Belmont-Mead	8 26	Spring	Typhoid	.....	trace	trace	faint oysters
5808	Belmont-Smith	9 26	Well	Typhoid	trace	trace	trace	none
5839	Belmont-Smith	9 26	Well	Typhoid	trace	5	slight	putrefactive
5819	Blanchester	10 2	Well	Quality	trace	trace	none	none
4871	Bloomington	4 3	Dug well	Typhoid	none	none	none	none
4875	Bloomington	4 5	Dug well	Typhoid	20	none	none	none
5337	Buffton	8 15	Drilled well	School	10	8	slight	earthy
4788	Bourneville	1 10	Driven well	Typhoid	.....	none	.....	faint
4846	Bourneville	2 19	Driven well	Typhoid	5	5	none	none
5217	Bourneville	7 6	Dug well	.....	none	none	none	none
5218	Bourneville	7 6	Dug well	.....	trace	none	none	none
5219	Bourneville	7 6	Dug well	.....	50	20	none	none
5279	Bourneville	7 6	Dug & dr. well	.....	none	none	none	none
5672	Bourneville	8 20	Driven well	Typhoid	trace	none	none	vegetable
5756	Brookville	9 17	Drilled well	Typhoid	.....	slight	slight	none
4815	Caledonia	9 25	Well	Typhoid	5	25	heavy	strong sweet'h
6203	Camden	2 12	Driven well	Typhoid	trace	none	trace	none
1840	Castine	11 27	Drilled well	Typhoid	.....	40	slight	pecul'r earthy
5119	Cedarville	3 13	Well	School	20	250	decided	none
5859	Cedarville	6 18	.....	Quality	5	none	very sl.	none
6119	Centerburg	10 8	Drilled well	Typhoid	.....	none	trace	faint earthy
.....	Champaign	.....	.....	.....	.....	.....	.....	.....
.....	Concord	11 7	Dr. & dug well	Typhoid	trace	10	sl'g't	slightly musty
4855	Chardon	3 31	Spring	Typhoid	.....	.....	.....	.....
4856	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
4857	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
4858	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
4859	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
4860	Chardon	3 31	Drilled well	Typhoid	.....	.....	.....	.....
4861	Chardon	3 31	Dug well	Typhoid	.....	.....	.....	.....
4862	Chardon	3 31	Dug well	Typhoid	.....	.....	.....	.....
4863	Chardon	3 31	Spring	Typhoid	.....	.....	.....	.....
4864	Chardon	3 31	Spring	Typhoid	.....	.....	.....	.....
4865	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
4866	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
4867	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
4868	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
4869	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
4870	Chardon	3 31	Well	Typhoid	.....	.....	.....	.....
5029	Chillicothe	6 6	Driven well	Sickness	.....	none	none	faint
5611	Circleville	9 28	Driven well	Typhoid	10	25	decided	none
5812	Circleville	9 28	Driven well	Typhoid	trace	trace	trace	none
5375	Columbus	7 31	Drilled well	Quality	none	trace	slight	none
5376	Columbus	7 31	Same as 5375	Quality	.....	.....	.....	.....
5377	Columbus	7 31	Same as 5375	Quality	.....	.....	.....	.....
5378	Columbus	7 31	Same as 5375	Quality	.....	.....	.....	.....



## FROM PRIVATE SUPPLIES AND SPECIAL SOURCES.

MILLION.

Oxygen Required.	Nitrogen as				Chlorine.	Alkalinity.	Total Solids.	Colon Present in 50 cc.	Bacteria per cc.	Remarks.
	Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.						
.50	.034	.006	trace	10.0	28.7	35	322	yes	7300	Suspicious.
.57	.048	.004	.004	12.0	18.3	37	371	yes	3700	Suspicious.
.76	.060	.002	.002	6.0	112.0	108	1334	no	1600	Suspicious.
.68	.198	.101	.002	none	40.8	372	714	no	1200	Usable.
1.18	.126	.050	none	none	78.7	312	618	no	21000	Polluted.
10.00	.258	.006	none	none	20.7	28	557	in 1 cc.	1	Good.
.25	.008	trace	.004	3.0	5.6	29	147	no	240	Good.
.29	.002	trace	.002	3.0	5.7	29	147	no	8	Good.
.23	.008	trace	trace	3.0	3.8	50	145	no	6700	Usable.
7.12	.....	.....	.030	3.0	3.3	.....	.....	no	.....	.....
.96	.....	.....	.002	3.0	4.3	.....	.....	yes	1300	Unsafe.
1.22	.042	.070	.020	none	44.4	418	754	in 1 cc.	11000	Abandon.
.20	.024	trace	trace	5.0	130.4	354	2116	no	750	Suspicious.
.96	.146	.030	.016	7.0	5.0	37	103	no	20	Polluted.
10.24	.388	.726	.016	trace	2012.5	110	3750	in 1 cc.	25	Usable.
.36	.012	.002	none	none	2.8	.....	.....	no	1400	Suspicious.
.55	.078	.054	.004	13.0	40.4	77	303	no	650	Suspicious.
.52	.044	.002	.002	10.0	42.0	210	655	no	2200	Usable.
1.22	.068	.028	none	none	46.8	468	850	no	150	Undesirable.
.95	.218	.122	trace	10.0	106.8	329	1188	no	2500	Suspicious.
.85	.118	.052	.010	7.0	83.0	328	912	no	1000	Usable.
1.40	.092	.030	trace	none	127.4	365	575	no	475	Unsatisfactory.
1.20	.230	.090	.004	2.0	189.8	391	1679	no	45	Undesirable.
.72	.124	.054	trace	8.0	117.8	333	1571	no	.....	Unsatisfactory.
trace	.066	.030	.004	1.0	43.4	267	883	no	25000	Usable.
.42	.030	.031	.010	2.0	1.0	172	227	no	1300	Polluted.
.77	.020	trace	.006	none	2.2	229	314	in 1 cc.	2600	Unsafe.
2.22	.242	1.718	.030	6.0	28.4	241	571	in 1 cc.	608	Suspicious.
1.00	.064	.034	.006	6.0	17.0	342	1176	no	90	Suspicious.
1.44	.218	.010	trace	18.0	232.5	407	1679	no	300	Good.
.15	.046	.004	.018	20.0	18.9	288	550	no	800	Usable.
4.68	.120	.160	none	none	406.0	276	2046	no	5700	Unsuitable.
.50	.006	trace	.180	10.0	7.5	277	442	no	8400	Unsuitable.
.28	.012	.004	none	none	1.7	276	352	no	1000	Usable.
.60	.026	trace	.004	12.0	10.6	256	494	no	75	Good.
2.34	.102	.004	.002	24.0	172.0	414	1469	no	600	Usable.
8.24	.148	.014	trace	6.0	6.3	tr.	259	no	325	Good.
.37	.014	.010	.004	none	.6	264	344	no	20	Abandon.
1.13	.256	.210	trace	4.0	1.6	305	411	no	700	Usable.
.94	.024	.14	none	none	6	440	413	no	80	Good.
2.77	.262	.072	trace	none	6.6	447	722	no	20	Usable.
.56	.024	trace	none	.50	5.3	237	341	no	80	Good.
trace	.008	.012	none	none	11.2	320	451	no	700	Usable.
1.98	.074	.006	.090	4.0	36.3	372	846	no	650	Usable.
.25	.062	.010	.002	6.0	8.5	460	811	no	.....	.....
.46	.072	.014	none	none	.4	344	430	no	.....	.....
1.29	.030	.040	.002	none	22.6	324	429	no	7400	Usable.
1.60	.....	.....	.002	8.0	15.4	.....	.....	no	100	.....
2.96	.....	.....	.004	16.0	13.6	.....	.....	no	8000	.....
1.40	.....	.....	trace	14.0	15.2	.....	.....	no	1800	.....
3.32	.....	.....	m're tr.	16.0	35.0	.....	.....	no	1500	.....
1.64	.....	.....	none	10.0	25.4	.....	.....	no	325	.....
3.40	.....	.....	.002	20.0	27.2	.....	.....	no	1900	.....
2.78	.....	.....	none	10.0	24.5	.....	.....	no	7000	.....
1.28	.....	.....	.002	2.0	21.4	.....	.....	no	2600	.....
2.64	.080	.007	none	10.0	42.8	.....	.....	no	1200	.....
1.20	.....	.....	trace	4.0	28.2	.....	.....	no	23	.....
1.40	.....	.....	trace	14.0	16.4	.....	.....	no	45	.....
1.26	.....	.....	trace	none	2.2	.....	.....	no	8	.....
1.24	.....	.....	.002	8.0	23.2	.....	.....	no	58	.....
3.34	.....	.....	trace	none	15.0	.....	.....	no	1700	.....
1.78	.....	.....	none	8.0	18.8	.....	.....	no	150	.....
.51	.....	.....	.060	2.0	5.7	.....	.....	no	350	Undesirable.
.52	.066	.016	trace	11.6	54.9	334	921	no	850	Usable.
.57	.024	.032	none	none	trace	317	372	no	40	Good.
1.19	.034	trace	trace	6.0	trace	283	420	no	500	Good.
8.04	.038	.160	none	none	26.0	326	2237	no	75	Usable.
.....	.....	.....	none	none	.....	.....	.....	no	1200	.....
.....	.....	.....	none	none	.....	.....	.....	no	1700	.....
.....	.....	.....	none	none	.....	.....	.....	in 1 cc.	2200	.....

## EXAMINATION OF MISCELLANEOUS WATERS FROM

PARTS PER

Sample Number.	Place.	Date collected.		Source of Sample.	Cause for Examination.	Color.	Turbidity.	Sediment.	Odor.
		Month.	Day.						
5529	Columbus	8	14	Drilled well	Quality	35	trace	slight	mouldy
6171	Columbus D. & D.	11	20	Dug well	Typhoid	none	none	none	none
5807	Columbus Grove	9	27	Well	Quality	10	10	slight	putrefactive
5530	Covington	8	14	Well	Typhoid	20	trace	slight	none
5806	Crawford-Holmes	9	26	Dug well	Typhoid	trace	15	slight	none
6289	Crawford Polk	12	18	Dug well	Typhoid	none	trace	none	none
6126	Darke-Butler	11	12	Driven well	Typhoid	distinct	distinct	distinct	none
6282	Darke-Butler	12	17	Dug well	Typhoid	none	none	none	none
6211	Darke-Greenville			Dug well	Typhoid				
5208	Delphos	6	26	Drilled well	Typhoid	none	20	decided	
4838	Eldorado	3	3	Dug & dr. well	Diarrhea	none	trace	trace	faint
5924	Erie-Huron	10	10	Dug well	Typhoid	trace	trace	none	none
4872	Fairfield-Walnut	4	4	Dug well	Typhoid	10	none	none	none
6112	Fayette-Jasper	11	2	Dug well	Typhoid	10	10	slight	none
4782	Fayette-Madison	1	10	Dug well	Typhoid	none	none	none	trace
5823	Findlay	10	3	Drilled well	Quality	slight	slight	slight	faint earthy
5824	Findlay	16	3	Drilled well	Quality	slight	slight	slight	faint earthy
4793	Fostoria	1	16	Drilled well	Typhoid	8	30	slight	pine wood
5030	Fostoria	6	7	Dug well	Typhoid	trace	trace	slight	faint
5755	Fostoria	9	17	Drilled well	Typhoid	trace	trace	trace	none
5798	Fostoria	9	21	Dug well	Typhoid	10	decided	decided	none
5216	Franklin	7	9	Dug well		trace	trace	trace	none
5757	Franklin	9	18	Drilled well	Typhoid	15	slight	slight	earthy
5818	Franklin	10	2	Drilled well	Typhoid	trace	350	heavy	none
5841	Franklin	10	14	Driven well	Typhoid	20	distinct	distinct	faint earthy
6125	Franklin-Perry	11	12	Dug well	Typhoid	none	none	trace	none
5731	Franklin	9	17	Driven well	Typhoid	180	decided	decided	none
5732	Franklin	9	17	Dug well	Typhoid	none	none	none	none
5799	Fredericktown	9	24	Driven well	Typhoid	trace	trace	trace	none
4774	Fremont	1	4	Dug well	Typhoid	trace	none	none	ft. vegetable
4803	Fremont	1	22	Drilled well	Typhoid	10	none	none	none
4809	Fremont	1	29	Dug well	Typhoid	12	10	slight	trace
5328	Fremont	7	16	Dug well	Typhoid	none	20	slight	none
5817	Fremont	1	1	Drilled well	Typhoid	trace	trace	trace	none
5754	Galion	9	17	Dug well	Typhoid	slight	slight	slight	none
4844	Greenfield	3	26	Spring	Dysentery	10	very sl.	very sl.	none
4804	Greenville	1	22	Dr. & dug well	Typhoid	none	none	none	none
5697	Greenville	9	13	Well	Typhoid	8	none	none	none
5764	Greenville	9	19	Dug well	Typhoid	trace	trace	trace	none
5814	Greenville	9	29	Dug well	Quality	none	none	none	none
6257	Greenville	12	13	Dug well	Typhoid	trace	trace	trace	faint
5446	Grove City	8	6	Dug well	Typhoid	trace	trace	trace	trace
5447	Grove City	8	6	Dug well	Typhoid	slight	slight	distinct	sweetish
5765	Groveport	9	17	Dug well	Typhoid	trace	trace	trace	none
6208	Groveport	11	28	Dug well	Typhoid	none	none	none	none
6109	Gustavus	10	28	Drilled well	Typhoid	trace	trace	trace	none
5031	Hamden Junction	6	7	Dug well	Typhoid	35	distinct	distinct	faint
5813	Hancock								
5673	Jackson	9	27	Drilled well	Typhoid	trace	10	decided	musty
5955	Hardin-Liberty	8	29	Dug well	Typhoid	10	10	trace	none
5686	Hardin-Taylor	10	18	Dug well	Typhoid	15	trace	trace	none
5152	Harrison	9	10	Drilled well	Typhoid	trace	80	very heavy	none
5696	Harrison	6	20	Spring	Typhoid	none	none	none	slight musty
5761	Hilliards	9	18	Well	Typhoid	none	none	trace	peculiar
5762	Hilliards	9	18	Well	Typhoid	none	none	none	none
5801	Hilliards	9	25	Drilled well	Typhoid	5	20	slight	musty
6115	Holgate	11	5	Drilled well	Typhoid	20	40	slight	none
5179	Huron	2	25	Dug well	Typhoid	none	none	slight	musty
5696	Huron	9	11	Cistern	Typhoid	trace	trace	trace	none
4932	Ironton	5	9	Driven well	Typhoid	12	trace	trace	none
5445	Ironton	8	5	Cistern	Typhoid	trace	trace	trace	none
5450	Ironton	8	8	Spring	Typhoid	20	distinct	distinct	none
5758	Ironton	9	17	Cistern	Typhoid	none	none	none	none

## PRIVATE AND SPECIAL SOURCES—Continued.

MILLION.

Oxygen Required.	Nitrogen as				Chlorine.	Alkalinity.	Total Solids.	Colon Present in 50cc.	Bacteria per cc.	Remarks.
	Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.						
.61	.024	none	.030	2.0	8.0	280	585	no	12	Usable.
1.66	.036	.024	.002	trace	27.6	412	1007	no	900	Usable.
1.42	.104	.208	none	none	9.2	383	448	no	200	Usable.
.65	.014	trace	trace	10.0	8.5	249	414	no	1100	Usable.
2.38	.066	.006	.012	10.0	24.0	381	663	yes	5400	Unsafe.
2.02	.070	.024	trace	5.0	178.2	304	750	in 1 cc.	250	Polluted.
2.00	trace	.140	trace	6.0	6.0	322	393	none	none	Usable.
3.36	.012	.008	trace	2.0	104.0	205	578	no	1100	Usable.
.60	.....	.....	.006	3.0	38.8	.....	.....	yes	140	.....
1.97	.211	.113	none	1.0	7.8	568	.....	.....	.....	Undesirable.
.90	.058	.108	trace	none	13.7	370	477	no	8000	Usable.
.79	.206	none	.012	6.0	24.0	314	647	no	2700	Suspicious.
1.67	.086	.026	.014	14.0	21.6	236	590	no	1850	Un-uitable.
3.37	.060	1.000	.006	none	5.0	374	3915	in 1 cc.	9450	Polluted.
1.26	.088	.004	.006	48.0	265.0	442	1789	yes	2000	Polluted.
1.47	.044	.090	trace	none	3.8	366	270	no	325	Suitable.
.94	.144	.148	.002	no ne	31.8	392	613	no	400	Usable.
1.54	.044	.394	.030	none	20.1	210	1450	no	2700	Undesirable.
2.12	.104	.002	none	1.0	70.9	288	875	no	350	Protect.
.95	.050	.038	none	none	18.6	419	639	no	20	Usable.
3.09	.064	.036	.010	none	35.4	434	865	no	1200	Suspicious.
1.20	.066	trace	trace	14.0	34.7	456	845	no	600	Usable.
.57	.046	.086	none	none	.8	188	652	no	25	Good.
2.76	.194	.152	none	none	21.6	396	794	no	85	Usable.
1.47	.040	.070	none	none	.6	398	400	no	85	Good.
2.40	trace	.002	trace	16.0	146.0	265	1167	no	1820	Usable.
1.99	.016	.164	trace	none	trace	452	553	no	100	Good.
3.02	.120	.110	.030	36.0	99.8	391	1160	in 1 cc.	70000	Unsafe.
.53	.028	.022	.004	7.0	1.0	19	270	no	100	Usable.
1.58	.048	trace	none	none	66.2	452	737	no	600	Good.
.85	.046	.720	.004	none	73.0	380	712	no	60	Usable.
.86	.020	trace	none	10.0	18.7	218	405	no	1000	Usable.
2.27	.130	.012	.002	none	143.0	411	965	no	9200	Unsatisfactory.
.75	.056	.032	trace	10.0	17.0	318	520	yes	750	Unsafe.
1.41	.050	.010	.02	12.0	25.6	227	763	no	700	Suspicious.
.66	.066	.480	none	none	2.7	433	513	no	33	Usable.
1.34	.080	.002	none	16.0	17.6	321	553	no	280	Usable.
.79	.052	.010	trace	2.0	25.8	388	667	no	450	Usable.
1.59	.056	.016	.010	36.0	88.0	347	856	in 1 cc.	7200	Unfit.
.86	.040	.028	.010	36.0	55.2	455	.....	no	55000	Past pollution.
1.71	.072	.050	trace	3.0	128.0	424	735	no	3700	Undesirable.
.61	.068	.008	.030	12.0	172.0	408	1582	in 1 cc.	2400	Unsafe.
1.20	.206	.116	.060	10.0	80.0	346	864	no	97000	Unsafe.
1.22	.124	.002	.016	none	60.4	482	1057	no	4600	Unfit.
.48	.048	none	.008	16.0	61.6	417	1098	no	330	Past pollution.
.18	.032	.020	.002	none	trace	264	454	no	120	Satisfactory.
.43	.032	.004	none	3.0	11.3	27	253	in 1 cc.	38000	Unsafe.
1.66	.050	.276	trace	none	8.4	388	818	no	1600	Usable.
1.35	.188	.194	.004	6.0	29.0	315	647	no	2000	Unsafe.
.80	.122	.024	none	none	19.0	578	536	no	1500	Usable.
.76	.110	.036	trace	none	38.0	397	761	no	425	Safe.
.62	.014	trace	trace	1.0	1.2	195	163	no	750	Suitable.
4.16	.200	.092	.100	120.0	173.0	324	1230	no	15	Unsafe.
1.57	.112	trace	.100	96.0	155.6	421	1506	no	500	Unsafe.
1.40	.096	.102	none	trace	trace	379	386	no	85	Usable.
1.09	.026	.240	none	trace	37.2	107	1238	no	75	Good.
2.04	.130	.056	.100	12.0	202.7	405	1102	yes	4900	Polluted.
.36	.034	.016	none	2.0	.8	62	100	no	400	Usable.
1.23	.084	.244	trace	trace	32.1	256	493	no	1300	Usable.
.90	.042	none	none	trace	16.4	65	156	no	62000	Usable.
.88	.018	.004	.002	4.0	.8	35	82	no	81500	Usable.
1.00	.032	.004	none	trace	27.4	116	290	no	6500	Usable.

## EXAMINATION OF MISCELLANEOUS WATERS FROM

PARTS PER

Sample Number.	Place.	Date collected.		Source of Sample.	Cause for Examination.	Color.	Turbidity.	Sediment.	Odor.
		Month.	Day.						
5681	Jefferson	9	5	Dug well	Typhoid	20	4	trace	none
5943	Kenton	10	17	Drilled well	Typhoid		10	trace	none
5944	Kenton	10	17	Dug well	Typhoid		slight	trace	none
5945	Kenton	10	17	Cistern	Typhoid		trace	trace	none
5946	Kenton	10	17	Cistern	Typhoid		trace	trace	barn-yard
5947	Kenton	10	17	Drilled well	Typhoid		slight	trace	none
5948	Kenton	10	17		Typhoid	12	trace	trace	none
5949	Kenton	10	17	Well	Typhoid				
5950	Kenton	10	17	Well	Typhoid				
5951	Kenton	10	17	Well	Typhoid				
5952	Kenton	10	17	Driven well	Typhoid				
5953	Kenton	10	17	Dug well	Typhoid				
6200	Kettlersville	11	22	Drilled well	Typhoid		10	slight	faint earthy
6108	Kingston	10	29	Dug well	Typhoid		none	none	faint
6298	Kingston	12	26	Dug well	Typhoid		none	none	none
5207	Knox-Middleby	6	28	Dug well	Typhoid	10	trace	trace	none
6249	Knox-Milford	12	12	Drilled well	Typhoid		trace	trace	peculiar
6290	Knox-Milford	12	12	Drilled well	Typhoid		none	none	none
6251	Knox-Milford	12	12	Dug well	Typhoid				
6252	Knox-Milford	12	12	Well	Typhoid				
6299	Knox-Milford	12	12	Dug well	Typhoid				
5209	Lancaster	6	29	Drilled well	Typhoid		400	decided	faint earthy
5362	Lexington	10	8	Dug well	Typhoid		20	slight	faint earthy
4841	Lisbon	3	19	Dug well	Typhoid	20	trace	very sl	none
5685	Logan								
4912	Washington	9	10	Well	Typhoid	10	45	decided	sl. vegetable
5815	Lorain-Avon	5		Cistern	Typhoid				
5815	Loveland	10	1	Dug well	Typhoid	trace	12	trace	sl. aromatic
5816	Loveland	10	1	Spring	Typhoid	trace	8	trace	none
5694	Luca	9	11	Dug well	Typhoid	trace	trace	trace	none
6281	Mantua	12	17	Drilled well	Typhoid		none	none	none
5920	Marietta	10	9	Well	Typhoid		none	none	faint oily
5921	Marietta	10	9	Well	Typhoid		trace	trace	none
5922	Marietta	10	9	Well	Typhoid		trace	slight	none
5923	Marietta	10	9		Typhoid		none	none	none
4778	Marion	1	9	Dug well	Typhoid	10	none	none	none
4779	Marion	1	9	Dug well	Typhoid	18	trace	very sl.	none
5913	Massillon	10	9	Artesian well	Quality		none	none	none
5963	Maumee	10	21	Dug well	Typhoid		trace	trace	faint
5965	Maumee	10	21	Dug well	Typhoid		trace	trace	peculiar
5203	Medina								
5727	Harrisville	6	26	Dug well	Typhoid	none	trace	none	none
5727	Medina								
5728	Wadsworth	9	13	Dug well	Typhoid	5	trace	trace	none
5728	Medina								
5729	Wadsworth	9	13	Drilled well	Typhoid	10	60	decided	none
5729	Medina								
6116	Wadsworth	9	13	Dug well	Typhoid	20	20	slight	sweet veg'able
6285	Mercer-Franklin	11	5	Dr. & dug well	Typhoid	trace	10	decided	none
6286	Mercer-Franklin	12	17	Well	School		10	slight	earthy
4839	Mercer-Franklin	12	17	Dug well	Typhoid		10	slight	trace
5015	Mercer-Recovery	3	12	Well	School	30	trace	very sl.	none
5015	Miamisburg	6	6	Dug well	Typhoid		none	trace	none
5016	Miamisburg	6	6	Dug well	Typhoid		none	none	none
5017	Miamisburg	6	6	Spring	Typhoid		trace	slight	ft. vegetative
5018	Miamisburg	6	6	Dug well	Typhoid		none	none	none
5149	Miamisburg	8	6	Drilled well	Quality		slight	slight	none
5059	Milford	10	19	Dug well	Typhoid		trace	trace	none
5280	Millersport	7	9	Driven well	Quality	none	none	none	none
4983	Mingo Junction	5	28	Drilled well	Typhoid				
4981	Mingo Junction	5	28	Spring	Typhoid	trace	none	none	none
5320	Mingo Junction	7	16	Drilled well	Quality	10	10	slight	none
5321	Mingo Junction	7	16	Drilled well	Quality	none	none	none	none
5322	Mingo Junction	7	16	Drilled well	Quality	30	40	decided	earthy
6129	Minster	11	10	Well	Typhoid				
6130	Minster	11	10	Well	Typhoid				
6131	Minster	11	10	Well	Typhoid				
6137	Minster	11	10	Well	Typhoid				
6148	Minster	11	10	Well	Typhoid				
6149	Minster	11	10	Well	Typhoid				



## PRIVATE AND SPECIAL SOURCES—Continued.

MILLION.

Oxygen Required.	Nitrogen as				Chlorine.	Alkalinity.	Total Solids.	Colon Present in 50cc.	Bacteriz per cc.	Remarks.
	Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.						
3.41	.126	.068	.300	60.0	559.4	612	4292	no	6700	Unsafe.
.72	.036	.282	trace	none	5.0	.....	.....	no	150	Good.
.81	.110	trace	.016	trace	6.2	.....	.....	no	13000	Polluted.
10.40	.276	.428	.011	trace	trace	.....	.....	no	500	Safe.
9.13	.530	.726	.040	trace	12.2	.....	.....	no	700	Polluted.
.90	.028	.394	.002	none	7.4	.....	.....	no	325	Good.
.40	.024	.030	none	none	12.4	346	850	no	42	Good.
.81	.....	.....	trace	none	.....	.....	.....	no	40	.....
.90	.....	.....	trace	none	.....	.....	.....	no	55	.....
.77	.....	.....	.004	none	.....	.....	.....	no	170	.....
1.18	.....	.....	none	none	.....	.....	.....	no	1900	.....
1.50	.....	.....	.030	6.0	49.0	.....	.....	no	1700	.....
5.91	.220	.026	.016	10.0	52.2	377	940	no	48000	Polluted.
.90	.130	.060	.002	trace	32.2	407	583	no	1100	Usable.
4.00	.052	.004	none	8.0	112.6	232	507	no	2200	Unsatisfactory.
1.11	.058	.002	.008	none	11.6	260	430	no	8000	Usable.
1.86	.....	.....	trace	6.0	64.8	.....	.....	no	5000	Undesirable.
.22	.....	.....	.004	10.0	80.0	.....	.....	no	4500	Undesirable.
1.86	.....	.....	.016	none	415.6	.....	.....	no	38000	Undesirable.
10.00	.....	.....	none	none	60.0	.....	.....	no	160	Undesirable.
4.08	.....	.....	trace	12.0	.....	.....	.....	no	3400	Suspicious.
1.68	.028	.208	.004	none	2.5	243	491	no	230	Usable.
.15	.269	.126	none	24.0	1.4	384	687	no	45	Usable.
.40	.024	.040	.024	12.0	34.0	68	710	no	500	Abandon.
.97	.122	.012	trace	none	16.0	397	528	no	55	Good.
8.88	.....	.....	.150	1.0	8.7	162	.....	no	24000	.....
1.24	.078	.058	.006	10.0	8.0	315	405	in 1 cc.	1600	Unsafe.
.48	.066	.048	none	6.0	5.6	270	391	in 1 cc.	2100	Unsafe.
.53	.052	.038	trace	7.0	20.8	194	339	no	300	Usable.
.45	trace	.004	none	trace	14.6	116	180	no	170	Good.
.33	.182	.012	none	8.0	21.8	320	642	no	340	Usable.
.63	.052	.100	.004	12.0	40.2	180	650	no	3700	Unsafe.
.69	.330	.112	.016	16.0	59.4	265	769	no	1.0	Suspicious.
1.71	.122	.094	none	2.0	39.8	43	317	no	600	Usable.
1.75	.060	.001	.002	10.0	54.4	196	550	no	2250	Undesirable.
3.22	.088	.002	.002	8.0	14.7	242	448	yes	1600	Polluted.
.71	.044	.008	none	none	2.0	292	317	no	7100	Usable.
4.52	.251	.180	.004	none	7.4	184	353	in 1 cc.	3600	Unsafe.
3.37	.238	.162	.010	4.0	59.4	403	560	in 1 cc.	7300	Unsafe.
.91	.054	.006	.004	12.0	94.2	375	2167	in 1 cc.	lost	Unsafe.
1.02	.050	.008	trace	none	81.4	218	602	no	1600	Usable.
.71	.098	.030	none	none	1.8	269	358	no	200	Usable.
1.86	.102	.010	trace	12.0	7.8	110	339	no	5300	Unsatisfactory.
1.51	.041	1.420	.006	none	141.8	203	1241	in 1 cc.	1450	Unsafe.
3.00	.032	.820	none	none	403.4	185	1227	no	4700	Undesirable.
5.86	.320	trace	.020	8.0	254.4	206	1070	no	14000	Polluted.
1.04	.064	.006	.002	5.0	7.5	282	366	no	130	Good.
.76	.050	.010	.016	7.0	8.7	419	523	no	1100	Undesirable.
.72	.026	.004	.004	2.0	7.8	315	482	in 1 cc.	1250	Unsafe.
1.33	.160	.050	.004	none	20.5	25	447	in 1 cc.	1800	Unsafe.
.45	.008	.062	trace	8.8	27.0	288	624	no	1750	Unsafe.
.78	.004	trace	.018	6.0	12.2	232	414	no	1470	Undesirable.
1.31	.016	.021	.020	10.0	67.2	147	525	no	1900	Polluted.
.91	.048	.008	none	none	8.2	410	537	no	52000	Usable.
.22	.....	.....	.006	2.0	16.1	.....	.....	no	700	.....
.27	.....	.....	none	14.0	93.5	35	313	in 1 cc.	2000	Unsafe.
.27	.030	.004	trace	2.0	40.0	90	541	no	140	Usable.
2.50	.022	.078	none	trace	10.0	115	498	no	750	Usable.
.25	.024	.112	none	none	252.0	185	583	no	1800	Usable.
2.58	.....	.....	.....	8.0	79.4	.....	.....	no	1900	.....
1.94	.....	.....	.....	8.0	91.6	.....	.....	no	15770	.....
4.11	.....	.....	.....	6.0	124.4	.....	.....	no	6700	.....
1.11	.....	.....	.....	24.0	281.0	.....	.....	no	8910	.....
3.05	.....	.....	.....	16.0	106.0	.....	.....	no	184000	.....
.44	.....	.....	none	.....	46.0	.....	.....	no	775	Usable.



## EXAMINATION OF MISCELLANEOUS WATERS FROM

PARTS PER

Sample Number.	Place.	Date collected.		Source of Sample.	Cause for Examination.	Color.	Turbidity.	Sediment.	Odor.
		Month.	Day.						
5730	Montgomery-Butler	9	13	Dug well	School	trace	trace	trace	none
6290	Montgomery-Miami	12	19	Dug well	Typhoid	trace	trace	trace	none
5600	Morrow	8	24	Drilled well	Quality	8	trace	trace	none
5601	Morrow	8	24	Driven well	Quality	trace	trace	trace	none
5663	Morrow	8	28	Driven well	Quality	10	15	decided	none
5664	Morrow	8	28	Drilled well	Quality	5	4	slight	none
6173	Mt. Hope	11	20	Dug well	Typhoid		trace	slight	faint
6019	Muskingum-Rich Hill	10	25	Dug well	Typhoid		none	none	none
6172	Napoleon	11	20	Cistern	Typhoid		trace	slight	faint woody
5329	Neville	7	18	Well	Quality	none	none	none	none
5330	Neville	7	18	Well	Quality	none	10	consid'le	earthy
6093	Newark	10	31	Driven well	Typhoid		20	trace	none
6096	Newark	10	31	Driven well	Typhoid		none	trace	none
4775	New Lexington	1	5	Dug well	Typhoid	17	trace	trace	faint
4776	New Lexington	1	5	Dug well	Typhoid	10	none	none	none
4901	New Lexington	4	30	Dug well	Typhoid		none	none	none
4885	Norwalk	4	10	Dug well	Typhoid	trace	none	trace	none
5800	Oak Harbor	9	24	Drilled well	Typhoid	17	40	decided	slight earthy
5671	Oberlin	8	29	Dug well	Typhoid	trace	25	decided	none
4842	Ottawa-Benton	3	26	Drilled well	Typhoid		none	none	trace
4843	Ottawa-Benton	3	26	Drilled well	Typhoid		30	slight	trace
6207	Pataskala	11	27	Dug well	Typhoid		none	none	none
4933	Piqua	5	10	Drilled well	Quality				
5035	Piqua	6	9	Well	Quality	10	none	none	none
5366	Piqua	7	26	Driven well	Typhoid	none	none	none	none
6283	Portage-Shalersville	12	17	Dug well	School		none	trace	none
3383	Portsmouth	5	2	Driven well	Factory				
6236	Preble-Harrison	12	12	Dug well	Typhoid		none	none	none
6204	Preble-Israel	11	26	Dug well	Typhoid		trace	trace	none
5019	Preble-Jackson	6	6	Dug well	Typhoid		none	trace	none
5336	Rendville	7	21	Dug well	Typhoid	4	none	trace	none
4798	Richland-Springfield			Dug well	Typhoid	40			
5210	Richland-Springfield	7	3	Dug well	Typhoid	10	35	decided	none
5211	Richland-Springfield	7	3	Dug well	Typhoid	10	40	decided	none
5820	Ross Colerain	10	1	Dug well	Typhoid		none	trace	faint earthy
4787	Ross-Twin	1	10	Cistern	Typhoid		10	trace	none
6114	Sandusky-Sandusky			Drilled well	Typhoid	40	20	slight	none
6201	Sandusky-Scott	11	26	Drilled well	Typhoid		10	slight	faint
6202	Sandusky-Scott	11	26	Drilled well	Typhoid		150	decided	earthy
5527	Scioto-Clay	8	13	Drilled well	Typhoid	none	none	none	none
5336	Scioto-Porter	10	18	Dug well	Typhoid				
5337	Scioto-Porter	10	18	Dug well	Typhoid		15	trace	vegetable
5760	Sebring	9	17	Drilled well	Typhoid		slight	slight	none
5822	Seneca-Jackson	10	2	Drilled well	School		slight	slight	none
4832	Seneca-Thompson	2	26	Well	Typhoid	trace	none	none	none
4833	Seneca-Thompson	2	26	Well	Typhoid	10	none	none	earthy
4777	Shelby	1	8	Dug well	Typhoid	10	none	none	none
4814	Shelby	2	12	Dug well	Typhoid	10	none	none	none
4359	Shelby	5	17	Drilled well	Typhoid		trace	trace	vegetative
5805	Shelby	9	26	Dug well	Typhoid	5	10	trace	none
6198	Shelby	11	22	Dug well	Typhoid		trace	trace	none
6199	Shelby	11	22	Cistern	Typhoid		trace	trace	none
6248	Shelby	12	11	Dug well	Typhoid		trace	trace	putrefactive
6098	Shelby-VinBuren	10	31	Dug well	Typhoid		none	trace	none
6205	Sherodsville	11	27	Drilled well	Typhoid		trace	trace	none
6206	Sherodsville	11	27	Dug well	Typhoid		trace	trace	none
6099	Somerset	11	1	Drilled well	School		50	distinct	faint earthy
5687	Stark-Bethlehem	9	11	Spring	Typhoid	4	trace	trace	none
6209	Stark-Canton	11	26	Dug well	Typhoid		trace	trace	none
6210	Stark-Canton	11	26	Spring	Typhoid		trace	slight	faint

## PRIVATE AND SPECIAL SOURCES—Continued.

MILLION.

Oxygen Required.	Nitrogen as				Chlorine.	Alkalinity.	Total Solids.	Colon Present in 30cc.	Bacteria per cc.	Remarks.
	Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.						
.72	.026	.006	trace	none	4.2	283	366	no	3400	Usable.
2.20	.076	.028	.040	trace	79.6	415	482	no	9700	Polluted.
.46	.014	trace	none	none	10.2	276	503	no	7000	Good.
.69	.004	trace	.002	6.0	18.2	268	453	no	375	Usable.
.50	.022	.038	trace	none	5.6	258	333	no	45	Good.
.23	.058	trace	none	10.0	5.4	296	398	no	200	Usable.
1.34	.018	trace	trace	12.0	28.4	123	337	in 1 cc.	3850	Unsafe.
.83	.064	.028	.006	5.0	17.4	283	438	no	1400	Suspicious.
15.80	.184	.092	.008	trace	2.4	23	55	yes	5500	Unsafe.
.67	.006	trace	.006	trace	5.6	272	390	no	.....	Usable.
.85	.006	.006	.012	2.0	2.4	277	411	no	10	Usable.
.36	.148	.106	trace	none	10.0	346	753	no	190	Usable.
.54	.044	.070	.020	trace	53.4	366	621	no	325	Abandon.
3.20	.240	.006	trace	30.0	124.0	6	864	no	9000	Abandon.
.72	.026	.002	.002	5.0	52.0	206	661	no	40	Suitable.
.66	.064	.012	.002	10.0	46.2	54	475	no	1200	Usable.
1.42	.066	.002	.002	4.0	48.2	174	543	no	730	Usable.
.96	.108	.066	trace	none	11.6	365	1475	in 1 cc.	1000	Unsafe.
1.33	.064	.024	trace	2.0	188.0	371	1135	no	150	Usable.
.55	.118	.242	.004	none	9.5	119	899	no	570	Usable.
1.19	.068	.126	.040	10.0	41.0	148	666	no	63	Suspicious.
1.30	.012	none	.012	4.0	36.0	383	610	no	220	Suspicious.
.76	.060	1.300	none	none	160.0	297	787	no	200	Good.
.45	.028	.012	trace	12.0	26.1	247	706	no	1000	Undesirable.
.92	.016	none	none	12.0	32.5	337	904	no	850	Usable.
1.36	.008	none	.006	2.0	60.0	259	412	no	180	Usable.
1.16	.....	.004	.004	12.0	56.0	.....	.....	no	22	.....
3.61	.054	.030	.006	6.0	254.0	299	900	no	5200	Abandon.
.93	.032	trace	.002	trace	10.2	243	485	no	7910	Usable.
1.31	.074	.016	trace	trace	36.0	300	555	no	1400	Usable.
1.97	.145	.035	trace	14.0	35.6	.....	.....	no	5150	Unsafe.
7.16	.....	.....	.006	18.0	97.5	.....	.....	no	18000	Polluted.
.93	.052	.146	.002	none	4.0	376	2132	no	1200	Usable.
.86	.060	.004	.006	12.0	42.0	330	747	no	200	Usable.
1.33	.066	.024	none	6.0	31.0	357	500	no	4000	Usable.
2.66	.058	trace	none	4.0	6.3	10	104	yes	11000	Suspicious.
4.27	.200	none	.012	40.0	314.8	798	2735	in 1 cc.	2700	Unsafe.
trace	trace	.044	none	none	6.2	295	343	no	60	Good.
1.80	.014	.050	none	none	4.2	299	440	no	500	Good.
.42	trace	trace	.002	trace	13.0	114	237	no	300	Good.
1.18	.....	.010	.010	12.0	57.0	63	.....	yes	200	Suspicious.
1.04	.128	.094	.006	14.0	31.0	34	441	yes	2100	Suspicious.
.69	.040	.188	.002	none	15.0	446	540	no	600	Usable.
2.13	.178	.116	trace	trace	2.0	310	380	no	12000	Usable.
.58	.014	trace	none	2.0	5.3	216	352	no	75	Good.
.46	.016	trace	.002	2.0	4.6	236	351	no	none	Good.
1.30	.078	trace	.002	6.0	140.0	358	1030	no	230	Usable.
1.65	.090	trace	.004	18.0	119.5	382	1344	no	390	Suspicious.
1.53	.066	.024	none	10.0	59.6	270	942	no	1200	Usable.
2.42	.040	.128	none	2.0	12.8	561	1066	no	7900	Unsatisfactory.
9.23	.084	trace	trace	2.0	45.0	300	736	no	24000	Unsatisfactory.
2.25	.050	trace	.004	trace	2.0	42	316	no	2200	Usable.
trace	.026	trace	trace	6.0	208.6	274	953	no	1360	Usable.
1.42	.038	.036	.002	none	7.0	390	556	no	3000	Usable.
.25	none	.024	.008	2.0	24.2	373	172	no	50	Good.
.10	.016	none	.004	10.0	25.0	44	407	no	1820	Unsafe.
.40	trace	trace	trace	none	6.0	165	258	no	100	Good.
.75	.032	.003	.002	6.0	3.0	126	190	in 1 cc.	4300	Suspicious.
.52	.038	trace	trace	trace	54.0	135	285	no	4500	Usable.
.22	.016	trace	none	2.0	7.6	27	72	no	32000	Usable.

## EXAMINATION OF MISCELLANEOUS WATERS FROM

PARTS PER

Sample Number.	Place.	Date collected.		Source of Sample.	Cause for Examination.	Color.	Turbidity.	Sediment.	Odor.
		Month.	Day.						
5960	Stark-Lake .....	10	18	Dug well.....	Typhoid .....	.....	none	none	ft. putrefactive
5961	Stark-Lake .....	10	18	Dug well.....	Typhoid .....	.....	none	none	none
5962	Stark-Lake .....	10	18	Drilled well ...	Typhoid .....	.....	10	slight	faint sweetish
6213	Stark- Nimishillen .....	12	6	Dug well.....	Typhoid .....	.....	trace	slight	slight musty
6214	Stark- Nimishillen .....	12	6	Dug well.....	Typhoid .....	.....	50	decided	none
4830	Steubenville .....	2	23	Spring .....	Quality .....	none	none	none	none
5674	Summit Station .....	9	3	Dug well.....	Typhoid .....	none	8	slight	sl. aromatic
5675	Summit Station .....	9	3	Dug well.....	Typhoid .....	10	8	slight	sl. aromatic
4920	Summit- Tallmadge .....	5	7	Dug well.....	Typhoid .....	.....	.....	.....	.....
4813	Swanton .....	2	7	Dug well.....	Typhoid .....	15	none	trace	trace
4834	Thornville .....	2	27	Drilled well ...	Quality .....	10	trace	none	oily
4935	Tiffin .....	5	15	Drilled well ...	Typhoid .....	.....	trace	trace	none
4997	Tiffin .....	5	31	Drilled well ...	Typhoid .....	.....	very sl.	very sl.	none
5290	Tiffin .....	7	12	Drilled well ...	Typhoid .....	none	5	none	none
5364	Tiffin .....	7	26	Drilled well ...	Typhoid .....	none	none	none	none
5365	Tiffin .....	7	26	Drilled well ...	Typhoid .....	none	none	very sl.	none
5821	Trumbull Liberty .....	10	2	Dug well.....	Typhoid .....	.....	none	none	faint
5374	Tuscarawas- Lawrence .....	7	27	Drilled well ...	Quality .....	35	80	decided	none
4835	Union-Jerome .....	2	27	Driven well...	Typhoid .....	20	60	decided	none
5668	Urbana .....	8	29	Dug well.....	Typhoid .....	15	10	slight	musty
4837	Vinton-Richland .....	3	6	Dug well.....	Typhoid .....	10	none	none	none
5954	Waldo .....	10	17	Dug well.....	Typhoid .....	.....	trace	trace	sweetish
4805	Warren .....	1	29	Drilled well ...	Typhoid .....	10	trace	very sl.	faint
5860	Warren Wash- ington .....	10	7	Dug well.....	Typhoid .....	.....	trace	trace	trace
5861	Warren Wash- ington .....	10	7	Dug well.....	Typhoid .....	.....	none	none	none
5941	Warren Wash- ington .....	10	16	Dug well.....	Typhoid .....	.....	.....	.....	.....
5942	Warren Wash- ington .....	10	16	Dug well.....	Typhoid .....	.....	.....	.....	.....
5963	Washington- Barlow .....	10	22	Dug well.....	Typhoid .....	.....	none	none	none
6287	Washington- Belpre .....	12	16	Cistern.....	Typhoid .....	.....	trace	trace	earthy
5334	Washington- Dunham .....	7	15	Dug well.....	Typhoid .....	30	none	slight	none
5335	Washington- Dunham .....	7	15	Dug well.....	Typhoid .....	10	none	slight	none
4961	Washington- Lawrence .....	5	21	Dug well.....	Typhoid .....	.....	trace	trace	trace
5679	Wauseon .....	9	4	Artesian well ..	Typhoid .....	4	trace	slight	none
5680	Wauseon .....	9	4	Artesian well ..	Typhoid .....	25	10	slight	none
6212	Wellston .....	8	8	Dug well.....	Typhoid .....	.....	trace	trace	none
5448	Wellsville .....	12	5	Drilled well ...	Quality .....	.....	trace	slight	none
5665	West Manchester .....	8	27	Well .....	Typhoid .....	25	35	decided	none
5293	Wood-Center .....	7	11	Dug well.....	Typhoid .....	none	none	none	none
5294	Wood-Center .....	7	11	Dug well.....	Typhoid .....	none	trace	decided	none
5295	Wood-Center .....	7	11	Dug well.....	Typhoid .....	none	40	trace	sulphur
4958	Woodfield .....	5	15	Dug well.....	Typhoid .....	.....	none	none	none
5370	Woodfield .....	7	27	Dug well.....	Typhoid .....	none	none	none	none
5281	Wood- Montgomery .....	7	9	Dug well.....	Typhoid .....	none	trace	trace	none
5291	Wood-Webster .....	7	11	Dug well.....	Typhoid .....	none	trace	trace	none
5292	Wood-Webster .....	7	11	Dug well.....	Typhoid .....	15	trace	trace	none
4934	Wyandot- Sycamore .....	5	14	Well .....	Typhoid .....	.....	trace	very sl.	none
5288	Wyandot- Sycamore .....	7	9	Well .....	Typhoid .....	none	none	none	none
5940	Xenia .....	10	15	Dug well.....	Typhoid .....	.....	slight	slight	none
5918	Youngstown .....	10	10	Well .....	Typhoid .....	.....	none	none	none
5919	Youngstown .....	10	10	Well .....	Typhoid .....	.....	trace	trace	none
5925	Youngstown .....	10	10	Well .....	Typhoid .....	.....	.....	.....	.....
5926	Youngstown .....	10	10	Well .....	Typhoid .....	.....	.....	.....	.....
5927	Youngstown .....	10	10	Drilled well ...	Typhoid .....	.....	.....	.....	.....

## PRIVATE AND SPECIAL SOURCES—Continued.

MILLION.

Oxygen Required.	Nitrogen as				Chlorine.	Alkalinity.	Total Solids.	Colon Present in 50cc.	Bacteria per cc.	Remarks.
	Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates						
1.81	.150	.096	.004	8.0	trace	319	975	no	2100	Unsatisfactory.
.82	.064	.038	trace	16.0	111.6	392	1166	no	2700	Unsatisfactory.
.63	.080	.036	none	none	134.4	239	276	no	240	Usable.
2.85	.230	.144	.024	6.0	329.0	294	1298	no	35600	Abandon.
.80	.124	.080	none	10.0	118.0	250	691	no	22400	Abandon.
.37	.022	.006	none	trace	6.5	185	319	no	150	Good.
.93	.050	.008	.030	48.0	113.0	435	1205	no	810	Suspicious.
1.80	.082	none	.020	36.0	92.4	236	825	no	1000	Suspicious.
.35	.060	trace	none	8.0	22.8	106	314	no	325	Usable.
1.11	.044	.010	.200	9.0	11.7	76	308	no	27000	Polluted.
.61	.040	.006	.016	1.0	12.4	278	416	no	4930	Usable.
1.43	.076	.180	.038	21.0	76.4	339	995	no	130	Abandon.
1.03	.124	.040	.040	20.0	74.5	128	939	yes	475	Unsafe.
1.23	.080	.060	.008	37.2	73.5	262	1021	no	16000	Suspicious.
1.52	.064	trace	none	none	27.4	380	631	no	450	Usable.
1.50	.064	trace	trace	10.0	23.2	259	597	no	1550	Past pollution.
1.06	.102	.016	.002	24.0	173.4	269	963	no	3600	Undesirable.
2.73	.136	.232	none	none	3.0	203	416	1	.....	Usable.
.64	.048	.500	none	none	3.5	378	1483	no	35	Usable.
1.66	.074	.094	.100	10.0	29.8	231	465	no	2900	Unsafe.
.58	.024	.006	trace	1.0	2.3	10	60	no	950	Good.
1.39	.081	.054	.016	6.0	75.2	397	2819	no	230	Suspicious.
1.31	.016	.890	none	trace	369.0	596	1270	no	1100	Usable.
1.88	.108	.110	trace	none	152.6	182	1980	.....	.....	Undesirable.
.36	.076	.004	trace	2.0	46.6	472	717	.....	.....	Undesirable.
.....	.....	.....	.....	.....	.....	.....	.....	no	6000	.....
.....	.....	.....	.....	.....	.....	.....	.....	no	9800	.....
.66	.068	.042	.004	24.0	135.4	187	919	no	3200	Unsafe.
2.68	.036	trace	trace	2.0	14.1	49	152	yes	5400	Unsuitable.
.67	.020	none	.002	2.0	21.5	82	1026	no	1300	Usable.
2.18	.038	.020	.004	6.0	28.0	230	537	no	3100	Usable.
.61	.....	.....	none	8.0	19.0	116	378	in 1 cc.	750	Unsuitable.
.24	.....	.....	.002	none	135.0	.....	560	no	230	Good.
2.10	.032	.170	.002	none	68.0	302	514	no	850	Usable.
5.88	.036	.020	.020	14.0	2190.0	77	4950	no	3900	Unsafe.
4.00	.116	.068	none	none	512.8	282	1658	no	2990	Objectionable.
19.96	.....	.....	2.000	6.0	.....	.....	.....	in 1 cc.	500000	.....
.44	.020	.208	none	none	.2	341	428	no	2400	Safe.
1.34	.062	.046	none	2.0	77.0	179	1517	in 1 cc.	550	Unsafe.
6.16	.142	.078	.108	4.0	36.5	232	1444	in 1 cc.	2700	Condemn.
5.80	.150	.366	none	none	2.6	225	1561	in 1 cc.	700	Polluted.
2.06	.124	.040	.010	6.0	61.6	37	486	in 1 cc.	4500	Polluted.
.27	.028	none	trace	10.0	85.0	107	638	no	20000	Undesirable.
1.20	.082	.046	trace	2.0	54.6	224	1843	no	34000	Undesirable.
3.07	.152	.030	.024	39.6	274.0	347	2636	no	75	Suspicious.
1.38	.058	.082	none	2.0	9.1	258	354	no	110	Usable.
1.36	.092	.016	.060	16.0	178.8	258	1414	no	2000	Condemn.
1.07	.040	.006	.006	6.0	36.1	303	577	no	850	Undesirable.
1.38	.082	.080	.024	trace	21.0	343	620	no	3000	Abandon.
1.00	.066	none	trace	10.0	59.2	96	.....	no	850	Usable.
.76	.024	.030	none	trace	2.8	216	.....	no	50	Safe.
1.82	.060	.282	trace	none	101.6	.....	.....	no	25	Usable.
2.45	.044	.006	trace	10.0	41.0	.....	.....	no	825	Suspicious.
.....	.....	.....	trace	4.0	11.1	.....	.....	no	41	Usable.

## EXAMINATION OF MISCELLANEOUS WATERS FROM

PARTS PER

Sample Number.	Place.	Date collected.		Source of Sample.	Cause for Examination.	Color.	Turbidity.	Sediment.	Odor.
		Month.	Day.						
5928	Youngstown.....	10	10	Well .....	Typhoid .....	.....	.....	.....	.....
5929	Youngstown.....	10	10	Well .....	Typhoid .....	.....	.....	.....	.....
5930	Youngstown.....	10	10	Spring .....	Typhoid .....	.....	.....	.....	.....
5931	Youngstown.....	10	11	Well .....	Typhoid .....	.....	.....	.....	.....
5932	Youngstown.....	10	11	Well .....	Typhoid .....	.....	.....	.....	.....
5933	Youngstown.....	10	11	Well .....	Typhoid .....	.....	.....	.....	.....
5934	Youngstown.....	10	11	Well .....	Typhoid .....	.....	.....	.....	.....
5935	Youngstown.....	10	12	Well .....	Typhoid .....	.....	.....	.....	.....
5936	Youngstown.....	10	12	Well .....	Typhoid .....	.....	.....	.....	.....
5937	Youngstown.....	10	12	Spring .....	Typhoid .....	.....	.....	.....	.....
6107	Youngstown.....	10	29	Well .....	Typhoid .....	.....	40	slight	earthy
6113	Youngstown.....	11	2	Drilled well ...	Typhoid .....	.....	none	none	none
5372	Zanesville .....	7	25	Spring .....	Quality .....	none	none	slight	none
5373	Zanesville .....	7	25	Spring .....	Quality .....	none	none	none	none

\* Phenol acidity.

\*\* Partial sample only. Taken in special investigation. No opinion.

† Filtered water.

‡ Sample six days in transit.



## PRIVATE AND SPECIAL SOURCES Concluded.

MILLION.

Oxygen Required.	Nitrogen as				Chlorine.	Alkalinity.	Total Solids.	Colon Present in 50cc.	Bacteria per cc.	Remarks.
	Albuminoid Ammonia.	Free Ammonia.	Nitrites.	Nitrates.						
2.58	.200	.004	.002	16.0	64.4	.....	.....	no	1000	Suspicious.
.47	.032	trace	trace	4.0	12.6	.....	.....	no	430	Usable.
.48	.030	.006	.010	12.0	47.8	.....	.....	no	490	Suspicious.
1.28	.280	.008	.006	28.0	96.2	.....	.....	yes	350	Unsafe.
1.05	.216	trace	none	10.0	28.8	.....	.....	no	2000	Suspicious.
2.40	.116	.138	.020	18.0	108.6	.....	.....	yes	2760	Polluted.
1.52	.248	.104	.004	8.0	13.6	.....	.....	.....	2500	Polluted.
.10	.024	.004	none	3.0	34.0	106	.....	no	65	Usable.
2.74	.134	.096	.008	4.0	9.0	172	.....	.....	1500	Unsafe.
1.16	.164	.082	trace	none	28.4	179	.....	no	65	Undesirable.
.54	.106	.068	none	none	24.6	246	350	no	250	Usable.
.86	.002	trace	.002	6.0	51.2	223	505	yes	775	Abandon.
.34	.028	trace	none	trace	20.3	trace	553	no	3100	Usable.
.27	.024	trace	none	trace	12.0	37	1391	in 1 cc.	4200	Undesirable.



# CITY AND VILLAGE HEALTH OFFICERS.

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Appointed to Serve in Lieu of a Board of Health by Council.

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Appointed by the Board of Health.

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CORRECTED TO FEBRUARY 28, 1907.



HEALTH OFFICERS APPOINTED BY COUNCIL TO SERVE IN LIEU OF A BOARD OF HEALTH, AND APPROVED BY THE STATE BOARD OF HEALTH, UNDER SECTION 187 OF THE MUNICIPAL CODE.

Village.	Name.	Appointed.	Approved.	Term expires 2d Monday in January.
Adamsville .....	George W. McDowell.	Feb. 1, 1907	.....	1908
Addyston .....	Dr. J. H. Haire.....	Jan. 8, 1907	Jan. 28, 1907.	1908
Agosta P. O. (See New Bloomington) .....	.....	.....	.....	.....
Alexandria .....	H. A. Parsons.....	Aug. 6, 1906	Aug. 27, 1906.	1908
Amelia .....	Dr. Homer C. Behymer .....	Jan. 2, 1907	Jan. 15, 1907.	1908
Anna .....	Dr. D. R. Millette.....	Jan. 14, 1907	Jan. 18, 1907.	1908
Ansonia .....	Dr. J. C. Poling.....	Jan. 14, 1907	Feb. 4, 1907.	1908
Antioch .....	Dr. D. W. Lowe.....	Jan. 18, 1906	Jan. 31, 1906.	1908
Antwerp .....	Charles A. Herzer.....	Jan. 7, 1907	Jan. 15, 1907.	1908
Apple Creek .....	Dr. A. A. Reinhart...	Jan. 21, 1907	Feb. 12, 1907.	1908
Arcadia .....	W. W. Moore.....	Jan. 7, 1907	Jan. 16, 1907.	1908
Arlington Heights ..	H. R. Veddern.....	Jan. 1, 1907	Feb. 5, 1907.	1908
Ashland .....	E. A. Kauffman.....	Jan. 15, 1906	Jan. 24, 1906.	1908
Ashley .....	Rodman Welch .....	Jan. 8, 1907	Jan. 16, 1907.	1908
Athalia .....	Wm. H. Wylie.....	Jan. 14, 1907	Feb. 4, 1907.	1908
Attica .....	Dr. C. A. Force.....	Aug. 1, 1905	Sept. 13, 1905.	1908
Bainbridge .....	Dr. W. W. Davis.....	Jan. 14, 1907	Feb. 4, 1907.	1908
Bairdstown .....	A. W. Solomon.....	Feb. 2, 1905	Apr. 26, 1905.	1908
Barberton .....	Dr. Bert Rodenbaugh.	Aug. 28, 1905	Sept. 15, 1905.	1908
Bay (West Dover, P. O.).....	Geo. L. Osborn.....	Feb. 4, 1907	Feb. 23, 1907.	1908
Beaver .....	Dr. E. B. Schrock.....	June 20, 1905	June 28, 1905.	1907
Belle Valley .....	C. E. Henry.....	Jan. 22, 1907	Jan. 29, 1907.	1908
Berlin X Roads.....	Henry Davis .....	June 6, 1905	June 16, 1905.	1907
Berlin Heights .....	Dr. G. W. Hine.....	Aug. 18, 1905	Sept. 23, 1905.	1907
Berne P. O. (See Carlisle) .....	.....	.....	.....	.....
Bethel .....	Dr. W. E. Thompson.	June 21, 1905	June 26, 1905.	1908
Bettsville .....	C. G. Norton.....	Jan. 29, 1907	Feb. 12, 1907.	1908
Blakeslee .....	James B. Lauchlen.....	Jan. 12, 1907	Jan. 17, 1907.	1908
Blanchester .....	U. B. Chambers.....	Feb. 4, 1907	Feb. 6, 1907.	1909
Bloomdale .....	G. W. Urie.....	Sept. 20, 1904	Oct. 7, 1904.	1910
Bloomburg .....	H. W. Worrell.....	Jan. 1, 1907	Feb. 8, 1907.	1908
Bolivar .....	Conrad H. Lebold.....	Jan. 30, 1906	Feb. 1, 1906.	1907
Botkins .....	James McManamy .....	Jan. 4, 1907	Mar. 8, 1907.	1908
Bowerton .....	H. Karn .....	Jan. 7, 1907	Jan. 15, 1907.	1909
Bowersville .....	J. E. Steward.....	Jan. 1, 1907	Feb. 23, 1907.	1908
Bradford .....	H. J. McKinney.....	Jan. 1, 1906	Jan. 17, 1906.	1908
Bradner .....	O. J. Mitchell.....	June 29, 1905	July 11, 1905.	1907
Bartnahl .....	J. G. Newkirk.....	Jan. 6, 1905	Feb. 2, 1905.	1907
Bremen .....	Dr. Frank P. Strayer.	Oct. 3, 1904	Oct. 14, 1904.	1910
Bridgeport .....	Dr. Van Wagener...	Jan. 7, 1907	Jan. 24, 1907.	1908
Brink Haven P. O. (See Gann) .....	.....	.....	.....	.....
Brooklyn Heights ..	Joseph E. Richardson.	Jan. 18, 1907	Jan. 29, 1907.	1908



## HEALTH OFFICERS APPOINTED BY COUNCIL—Continued.

Village.	Name.	Appointed.	Approved.	Term expires 2d Non-day in January.
Broughton .....	James Boroff .....	Jan. 16, 1907	Jan. 22, 1907.	1908
Burbank .....	A. W. Hoffman.....	Feb. 5, 1906	Feb. 8, 1906.	1907
Butler .....	E. E. Staunton.....	Jan. 21, 1907	Feb. 4, 1907.	1908
Butlersville .....	Elias Smith .....	Feb. 4, 1907	Feb. 23, 1907.	1908
Byesville .....	John W. Geary.....	Feb. 16, 1906	Feb. 28, 1906.	1907
Cadiz .....	Dr. W. H. Lemmon...	Jan. 7, 1907	Jan. 16, 1907.	1908
Calais .....				
Caldwell .....	Dr. J. L. Gray.....	Jan. 14, 1907	Feb. 5, 1907.	1908
Camden .....	Dr. W. E. Pryor....	Jan. 7, 1907		1908
Canal Winchester ...	Jno. W. Shook.....	Feb. 5, 1906	Feb. 28, 1906.	1908
Cannelsville .....	R. T. Homman.....	May 4, 1905	Aug. 10, 1905.	1908
Cardington .....	Dr. W. A. Smith.....	Apr. 2, 1906	May 8, 1906.	1907
Carey .....	Joseph F. Wonder....	Jan. 14, 1907	Jan. 18, 1907.	1908
Carlisle (Berne P. O.) .....	W. R. Bramhall.....	Jan. 1, 1906	Jan. 10, 1906.	1908
Carthage .....	Samuel B. Gilchrist...	Jan. 29, 1907	Feb. 8, 1907.	1908
Casstown .....	Dr. W. W. Baker.....	Jan. 26, 1906	Feb. 3, 1906.	1908
Cecil .....	S. E. Demuth, M. D..	Oct. 19, 1906	*	
Centerville .....	Dr. Dudley Keever....	Jan. 16, 1907	Jan. 18, 1907.	1908
Chagrin Falls .....	D. A. Groves.....	Jan. 5, 1906	Jan. 17, 1906.	1908
Chambersburg (Eureka P. O.) .....	Dr. W. J. Fletcher....	Jan. 7, 1907	Jan. 15, 1907.	1908
Chardon .....	Harvey L. Williams...	Jan. 3, 1907	Jan. 29, 1907.	1908
Chatfield .....	Samuel Lutz .....	Jan. 9, 1907	Jan. 15, 1907.	1908
Chesterhill .....	E. P. Worrell.....		*	
Chesterville .....	Dr. J. D. Varney.....	Jan. 2, 1907	Jan. 18, 1907.	1908
Cheviot .....	Charles Craig .....	Jan. 16, 1907	Jan. 18, 1907.	1908
Chickasaw .....	H. S. Schaefer.....	Feb. 5, 1907	Feb. 12, 1907.	1908
Clarksburg .....	J. E. Johnson.....	Feb. 5, 1907	Feb. 23, 1907.	1908
Clarksville .....	Perry Wilson .....	Jan. 17, 1907	Feb. 4, 1907.	1908
Cleveland Heights ..	Dr. W. E. Shackleton.	Jan. 16, 1906	Jan. 22, 1906.	1907
Cleves .....	Dr. W. C. Hughes....	Mar. 6, 1906	Mar. 16, 1906.	1907
Cloverdale .....	Dr. J. E. Stephan....	July 11, 1906	Aug. 4, 1906.	1908
Coalton .....	J. C. Duncan.....	Jan. 31, 1906	Feb. 3, 1906.	1907
College Corner .....	J. Emery Paxton.....	Feb. 5, 1906	Feb. 28, 1906.	1908
Columbus Grove .....	John A. Downard.....	Feb. 4, 1907	Feb. 12, 1907.	1908
Commercial Point ...	Thomas McHale .....	Jan. 21, 1907	Feb. 4, 1907.	1908
Continental .....	W. J. Conklin.....	Jan. 4, 1906	Jan. 24, 1906.	1907
Corning .....	William Anderson ....	Jan. 7, 1907	Feb. 23, 1907.	1908
Corwin .....	Jacob I. Clark.....	Jan. 31, 1906	Feb. 10, 1906.	1909
Creston .....	Charles A. Mellen....	Jan. —, 1906	Jan. 9, 1906.	1908
Croton P. O. (See Hartford) .....				
Crown City .....	J. V. Stevers.....	Sept. 22, 1905	Sept. 27, 1905.	1908
Cumberland .....	J. T. Aiken.....	Feb. 13, 1906	Mar. 9, 1906.	1908
Custar .....	H. Mannhardt, M. D..	Jan. 7, 1907	Jan. 17, 1907.	1908
Cuvahoga Falls .....	W. W. Scupholm.....	Jan. 16, 1907	Jan. 29, 1907.	1908
Dalton .....	Dr. J. Coleman Haney.	Jan. 5, 1906	Jan. 17, 1906.	1907
DeGraff .....	J. W. Hendershott....	Feb. 12, 1907	Feb. 23, 1907.	1908
Delhi .....	C. B. Davis.....	Aug. 28, 1906	Sept. 22, 1906.	1909

\* Approval held for further information in regard to ordinance.

## HEALTH OFFICERS APPOINTED BY COUNCIL — Continued.

Village.	Name.	Appointed.	Approved.	Term expires 2d Monday in January.
Dell Roy .....	S. W. Snee.....	Jan. 21, 1906	Feb. 12, 1907.	1908
Delphos .....	Dr. Ezra Burnett.....	Jan. 24, 1907	Feb. 5, 1907.	1908
Deshler .....	Isaac Collins .....	Jan. 18, 1907	Jan. 29, 1907.	1908
Dexter City .....	Dr. E. E. Coborn....	July 1, 1905	Sept. 15, 1905.	1907
Dillon P. O. (See Cannelville) .....	.....	.....	.....	.....
Doylestown .....	Frank Dennise .....	Jan. 29, 1907	Feb. 23, 1907.	1908
Dublin .....	Newton J. Dominy...	Feb. 25, 1907	.....	1908
Dunkirk .....	Dr. C. C. McLaughlin.	Feb. 4, 1907	Feb. 8, 1907.	1908
Dupont .....	J. A. Myers.....	Jan. 14, 1907	Feb. 12, 1907.	1908
East Springfield .....	Dr. Harry L. Fiscus..	Sept. 12, 1904	Sept. 13, 1904.	1908
Eaton .....	Geo. W. Jones.....	Jan. 8, 1906	Jan. 17, 1906.	1908
Edison .....	Dr. John H. Jackson..	Sept. 21, 1905	Oct. 16, 1905.	1909
Euclid .....	P. J. Cooney.....	Jan. 22, 1906	Feb. 10, 1906.	1907
Eureka P. O. (See Chambersburg) ..	.....	.....	.....	.....
Fairfield .....	Z. T. Hebble.....	† May 8, 1906	.....	1908
Fairport Harbor .....	J. H. Werbeach.....	Jan. 29, 1907	Feb. 5, 1907.	1909
Farmersville .....	Henry P. Oldfather...	May 2, 1906	May 21, 1906.	1907
Fayette .....	Benjamin Stoner .....	Oct. 10, 1906	Oct. 26, 1906.	1908
Fayetteville .....	Dr. F. A. Johnson....	May 7, 1906	May 16, 1906.	1907
Felicity .....	C. N. Crawford.....	Jan. 25, 1907	Jan. 29, 1907.	1908
Fern Bank .....	James E. Hickman....	May 3, 1903	Mar. 11, 1905.	1909
Flushing .....	George Wheeler .....	Aug. 7, 1905	Aug. 24, 1905.	1907
Frankfort .....	John A. Davis.....	Feb. 4, 1907	Feb. 8, 1907.	1908
Franklin .....	John B. Miller.....	Jan. 1906	Jan. 9, 1906.	1907
Frazeyburg .....	John W. Blizzard.....	Jan. 9, 1906	Jan. 31, 1906.	1907
Freeport .....	Stewart Ferrell .....	Jan. 8, 1906	Jan. 17, 1906.	1907
Freeport (Prairie Depot P. O.).....	J. W. Coy.....	Jan. 21, 1907	Feb. 23, 1907.	1908
Gann (Brink Haven P. O.).....	David W. Cunningham	Feb. 26, 1906	Mar. 16, 1906.	1908
Garrettsville .....	Dr. Geo. R. French .....	Jan. 17, 1907	Feb. 12, 1907.	1908
Genoa .....	George W. Wright....	Jan. 31, 1906	Feb. 23, 1906.	1908
Georgetown .....	Samuel F. Walker....	Jan. 20, 1906	Feb. 16, 1906.	1907
Gettysburg .....	Dr. John Emerson	.....	.....	.....
Geyer .....	Monger .....	Oct. 23, 1905	Nov. 3, 1905.	1907
Glendale .....	Thos. H. Irwin.....	Jan. 2, 1906	Feb. 10, 1906.	1907
Glouster .....	Clifford Allen .....	Feb. 5, 1906	Feb. 16, 1906.	1907
Gnadenhutten .....	David Dille .....	Jan. 16, 1906	Jan. 31, 1906.	1907
Gordon .....	L. S. Winsch.....	Feb. 5, 1906	Apr. 5, 1906.	1908
Grafton .....	H. Z. Silver.....	Jan. 7, 1907	*	1908
Grand Rapids .....	John Cahill .....	Jan. 8, 1907	Jan. 15, 1907.	1908
Grandview Heights...	L. L. Mowan.....	Oct. 2, 1905	Oct. 21, 1905.	1907
Green Camp .....	Dr. McKendree Smith	Jan. 28, 1907	.....	1908
Greenfield .....	G. W. Collins.....	Jan. 1906	Feb. 8, 1906.	1908
Grove City .....	Taylor Neff .....	Aug. 6, 1906	Aug. 23, 1906.	1907
Grover (Tiltonville P. O.).....	Samuel Douglass .....	Jan. 14, 1907	Feb. 4, 1907.	1908
	Wm. Cunningham ....	Feb. 9, 1906	Mar. 9, 1906.	1908

† Appointed by the State Board of Health.

\* Approval held for further information concerning ordinances.

## HEALTH OFFICERS APPOINTED BY COUNCIL—Continued.

Village.	Name.	Appointed.	Approved.	Term expires 2d Mon- day in January.
Groverhill .....	G. W. Morris.....	Feb. 12, 1906	Feb. 23, 1906.	1907
Hanover .....	Dr. D. O. Roberts.....	Jan. 21, 1907	Jan. 23, 1907.	1908
Harrisburg .....	Mason Sealock .....	Jan. 8, 1906	Jan. 17, 1906.	1907
Harrod .....	John Blair, Sr.....	Aug. 16, 1905	Sept. 23, 1905.	1907
Hartford (Croton P. O.) .....	Dr. C. B. Hempstead..	Jan. 9, 1906	Jan. 31, 1906.	1907
Harveysburg .....	Sam'l J. Ellison, M. D.	Jan. 14, 1907	Jan. 22, 1907.	1908
Haskins .....	Asher S. DeMuth.....	May 7, 1906	Jan. 18, 1907.	1908
Haviland .....	Myron A. Hanna, M. D. ....	Sept. 24, 1906	Oct. 8, 1906.	1908
Hebron .....	Dr. Geo. N. Brown....	Feb. 4, 1907	Feb. 12, 1907.	1909
Higginsport .....	F. M. Cahill.....	Feb. 4, 1907	*	1908
Hilliards .....	Dr. C. S. Latham.....	Nov. 20, 1905	Mar. 9, 1906.	1908
Holgate .....	Adam Kemmer .....	Feb. 1, 1907	Feb. 5, 1907.	1908
Hollansburg .....	Dr. A. W. Meek.....	Feb. 1, 1904	Feb. 6, 1904.	1908
Hopedale .....	Dr. Elmer T. Kuhn..	Jan. 7, 1907	Jan. 16, 1907.	1908
Hoytville .....	H. W. Mason.....	Jan. 21, 1907	Feb. 8, 1907.	1908
Huntsville .....	Dr. G. W. Jones.....	Jan. 28, 1907	Feb. 5, 1907.	1908
Huron .....	Robert Day .....	Jan. 8, 1906	Feb. 16, 1906.	1907
Irondale .....	Howell Williams .....	Jan. 17, 1907	Feb. 23, 1907.	1908
Jackson Center .....	A. V. Derr, M. D....	Jan. 15, 1906	Jan. 17, 1906.	1907
Jefferson .....	W. S. Andrews.....	Jan. 1906	Jan. 10, 1906.	1907
Jeffersonville .....	William S. Reid.....	Jan. 15, 1907	Jan. 17, 1907.	1908
Jeromeville .....	George Schroll .....	Jan. 21, 1906	Jan. 28, 1907.	1908
Jewett .....	T. F. Beckett.....	Jan. 2, 1907	Jan. 9, 1907.	1909
Kalida .....	Henry Recker .....	July 17, 1905	July 26, 1905.	1907
Kennedy Heights .....	George Romes .....	May 2, 1906	June 30, 1906.	1907
Kettlersville .....	Dr. O. O. LeMaster..	Jan. 7, 1907	Feb. 8, 1907.	1908
Kossuth .....	William Earhart .....	Feb. 2, 1906	Feb. 23, 1906.	1908
Lakeside .....	Dr. O. L. Mapes.....	July 5, 1904	July 13, 1904.	1905
Lakeview .....	E. D. Carr .....	Oct. 18, 1904	Jan. 26, 1905.	1907
Larue .....	G. L. Markwith.....	Feb. 4, 1907	Feb. 8, 1907.	1909
Laura .....	Charles O. Hall.....	Jan. 7, 1907	Feb. 5, 1907.	1908
Leesburg (Leesville P. O.) .....	A. R. Morrison.....	Jan. 7, 1907	Jan. 16, 1907.	1908
Lexington .....	J. P. Stober, M. D....	Jan. 7, 1907	Jan. 15, 1907.	1908
Limaville .....	T. T. Arnold.....	Jan. 3, 1907	Jan. 18, 1907.	1908
Lindsey .....	Dr. Wm. E. Higbie..	Feb. 4, 1907	Feb. 23, 1907.	1908
Lisbon .....	David Eells .....	Jan. 14, 1907	Jan. 18, 1907.	1908
Lithopolis .....	Dr. J. O. Stout.....	Jan. 14, 1907	Feb. 4, 1907.	1908
Lockbourne .....	Leon Harrison .....	Jan. 15, 1907	Jan. 29, 1907.	1908
Lockland .....	Peter Butchar .....	Jan. 14, 1907	Jan. 24, 1907.	1908
Lodi .....	Henry Selders .....	Feb. 4, 1907	Feb. 8, 1907.	1908
Logan .....	Dr. M. H. Cherring- ton .....	Dec. 11, 1906	Dec. 18, 1906.	1908
London .....	Dr. W. H. Christo- pher .....	June 9, 1905	June 12, 1905.	1908
Lore City .....	Joseph Todd .....	Jan. 7, 1907	Jan. 29, 1907.	1908
Loveland .....	Dr. F. H. Leever .....	Feb. 11, 1907	Feb. 23, 1907.	1908
Lowellville .....	Charles M. Clarke....	Jan. 21, 1907	Feb. 5, 1907.	1908

\* Approval held for further information concerning ordinance.

## HEALTH OFFICERS APPOINTED BY COUNCIL—Continued.

Village.	Name.	Appointed.	Approved.	Term expires 2d Monday in January.
Lucas .....	Wm. Baer .....	Jan. 1, 1906	Feb. 16, 1906.	1907
Lynchburg .....	W. H. McClelland....	July 2, 1906	July 19, 1906.	1908
Lyons .....	Dr. Thomas Blair....	Feb. 5, 1906	Feb. 28, 1906.	1908
McArthur .....	Dr. Edgar F. Collins.	Jan. 14, 1907	Feb. 4, 1907.	1908
McComb .....	James H. Bial.....	Feb. 4, 1907	.....	1908
Macksburg .....	O. S. Gilchrist.....	Apr. 5, 1906	Apr. 30, 1906.	1908
Madison .....	Dr. S. D. Good.....	Feb. 5, 1907	Feb. 23, 1907.	1908
Maineville .....	Joseph G. Trimble....	Feb. 5, 1906	Feb. 23, 1906.	1907
Marengo .....	I. E. Eakins.....	Feb. 4, 1907	Feb. 6, 1907.	1909
Marseilles .....	Dr. E. S. Jones.....	Apr. 3, 1905	Apr. 13, 1905.	1907
Marshallville .....	E. P. Willford.....	Jan. 7, 1907	Jan. 15, 1907.	1908
Martinsburg .....	Dr. N. S. Toland.....	Feb. 20, 1905	Mar. 15, 1905.	1908
Marysville .....	Dr. C. W. Hoopes.....	Jan. 25, 1906	Jan. 31, 1906.	1907
Maumee .....	Philip Hartman .....	Jan. 19, 1907	Jan. 29, 1907.	1908
Medina .....	F. L. Harding.....	Feb. 13, 1906	May 8, 1906.	1907
Melrose .....	Thomas J. Meyers.....	June 14, 1905	June 16, 1905.	1907
Mendon .....	S. C. Lemunyon.....	Jan. 3, 1907	Jan. 18, 1907.	1908
Mentor .....	Dr. J. W. Lowe.....	Jan. 3, 1906	Feb. 16, 1906.	1907
Mifflin .....	Dr. Jas. H. S. Hutch- ison .....	Feb. 2, 1906	Feb. 10, 1906.	1908
Milan .....	George W. Curtis.....	Jan. 22, 1906	Mar. 9, 1906.	1907
Milford .....	Dr. Con W. Gatch....	Sept. 26, 1905	Oct. 16, 1905.	1907
Milford Center .....	Martin Frye .....	Apr. 13, 1906	May 8, 1906.	1908
Miller City .....	Dr. R. J. Dillery.....	†July 11, 1906	.....	1908
Miltonsburg .....	Dr. C. R. Keysor.....	Feb. 4, 1907	Feb. 12, 1907.	1908
Minerva .....	Elmer E. Fultz.....	Jan. 23, 1906	Feb. 10, 1906.	1908
Mingo Junction .....	Dr. W. W. McMillan.	Jan. 23, 1907	Feb. 8, 1907.	1908
Minster .....	C. H. Dickman.....	Jan. 12, 1906	Jan. 24, 1906.	1907
Mogadore .....	Edward E. Bixler.....	Sept. 5, 1906	Sept. 10, 1906.	1909
Montezuma .....	Geo. Stafford .....	Dec. 26, 1906	Jan. 9, 1907.	1908
Morristown .....	A. M. Poole.....	Jan. 1906	Jan. 10, 1906.	1908
Morrow .....	Dr. Leonard Mounts..	Jan. 24, 1907	Feb. 12, 1907.	1909
Mt. Eaton .....	Dr. C. M. Clark.....	†Nov. 1, 1906	.....	1909
Mt. Gilead .....	Dr. Geo. H. Pugh.....	Feb. 13, 1907	Feb. 23, 1907.	1908
Mt. Healthy .....	Dr. Lafayette New- farth .....	Jan. 15, 1907	Feb. 12, 1907.	1908
Mt. Orab .....	Dr. C. H. Matthews..	Apr. 9, 1906	June 13, 1906.	1907
Mt. Sterling .....	Robert Leach, M. D..	Jan. 4, 1907	Jan. 15, 1907.	1908
Mt. Washington .....	Dr. Wm. C. Langdon.	Dec. 4, 1906	Feb. 23, 1907.	1908
Nashville .....	David Parks .....	Dec. 24, 1906	.....	1908
Nevada .....	Dr. S. S. Barrett.....	Jan. 14, 1907	Feb. 4, 1907.	1909
New Alexandria .....	Dr. C. E. Gourley....	Mar. 26, 1906	Apr. 5, 1906.	1912
New Bloomington (Agosta P. O.)....	W. H. Carey.....	Feb. 5, 1906	Feb. 16, 1906.	1908
New Bremen .....	Dr. E. M. Phelps.....	Jan. 2, 1907	Jan. 9, 1907.	1908
New Carlisle .....	V. B. Littleton .....	Feb. 4, 1907	Feb. 12, 1907.	1908
New Concord .....	Dr. J. Milton O'Neal.	Jan. 14, 1907	.....	1908
New Holland .....	John Morris .....	July 11, 1906	Dec. 14, 1906.	1907
New Lebanon (Pots- dam P. O.).....	D. W. Shellabarger...	Oct. 2, 1905	Oct. 2, 1905.	1907

† Appointed by the State Board of Health.



## HEALTH OFFICERS APPOINTED BY COUNCIL—Continued.

Village.	Name.	Appointed.	Approved.	Term expires 2d Monday in January.
New Lebanon (Montgomery Co.) .....	L. B. Piatt.....	Mar. 3, 1904	Jan. 14, 1905.	1907
New Lexington .....	John W. Holden....	Jan. 14, 1907	Jan. 22, 1907.	1908
New Madison .....	W. B. Harter.....	Jan. 7, 1907	Jan. 15, 1907.	1908
New Matamoras ....	J. R. Johnson.....	Feb. 4, 1907	Feb. 23, 1907.	1908
New Paris .....	Dr. G. L. Lyne.....	Feb. 5, 1906	Feb. 10, 1906.	1907
New Riegel .....	Anthony Brichner ...	Jan. 21, 1907	Feb. 4, 1907.	1908
New Salem .....	Dr. F. C. Adams....	Dec. 10, 1906	Dec. 18, 1906.	1908
New Straitsville ....	James C. Duffy.....	Feb. 5, 1906	Feb. 16, 1906.	1907
Newton Falls .....	Dr. H. M. Mealey....	Feb. 1, 1907	Feb. 6, 1907.	1908
Newtown .....	Dr. Thos. B. Mulloy..	Jan. 30, 1907	Feb. 23, 1907.	1908
New Vienna .....	Dr. Geo. R. Conard..	Jan. 28, 1907	Feb. 5, 1907.	1908
New Washington ...	Isaac Hosler .....	Jan. 9, 1907	Feb. 12, 1907.	1909
New Waterford ....	Thomas H. Todd.....	Jan. 28, 1907	Feb. 12, 1907.	1908
New Weston .....	A. Pearson, M. D....	Aug. 15, 1905	Aug. 18, 1905.	1907
Ney .....	Dr. P. M. Lehman...	Feb. 4, 1907	Feb. 6, 1907.	1908
North Amherst .....	Dr. Washington Foster .....	Jan. 15, 1907	Jan. 22, 1907.	1908
North Bend .....	Thomas W. Pearson..	Jan. 14, 1907	Jan. 17, 1907.	1908
North Robinson ....	James E. Morton....	Mar. 13, 1905	Apr. 10, 1905.	1908
Nottingham .....	Wm. O. Jenks, M. D.	Feb. 4, 1907	Feb. 12, 1907.	1908
Oakhill .....	David C. Loyd.....	Jan. 8, 1907	Jan. 16, 1907.	1908
Oakley .....	H. H. Schulze, M. D.	Nov. 27, 1906	Dec. 12, 1906.	1908
Oakwood .....	Martin Shisler .....	Jan. 16, 1907	Jan. 22, 1907.	1908
Orangeville .....	Dr. Ralph R. Root...	June 24, 1903	Oct. 9, 1903.	1909
Osborn .....	W. S. Lobaugh.....	Feb. 12, 1907	Feb. 23, 1907.	1907
Osgood .....	W. F. Davidson.....	Jan. 16, 1906	Jan. 27, 1906.	1907
Osnaburg .....	Dr. Aaron Busby....	Jan. 30, 1907	Feb. 12, 1907.	1908
Ostrander .....	M. M. McBride.....	Jan. 7, 1907	Feb. 4, 1907.	1908
Ottoville .....	Dr. Jno. F. Ockuly...	Jan. 1906	Jan. 10, 1906.	1907
Oxford .....	D. P. Beaton.....	Jan. 1, 1907	Jan. 9, 1907.	1908
Palestine .....	W. E. Kester.....	Feb. 4, 1907	Feb. 23, 1907.	1908
Payne .....	Dr. G. W. Boyle....	Jan. 27, 1907	.....	1908
Peebles .....	Dr. G. F. Thomas....	Feb. 5, 1906	Feb. 8, 1906.	1907
Pickerington .....	Thomas Tussing ....	Feb. 11, 1907	Feb. 23, 1907.	1908
Pioneer .....	Arthur F. Norris....	Jan. 8, 1907	Jan. 16, 1907.	1908
Plain City .....	Oran Long .....	Feb. 5, 1906	Feb. 10, 1906.	1907
Plainfield .....	Wesley Lawrence ....	Sept. 4, 1905	Sept. 8, 1905.	1908
Pleasant City .....	Silas W. German....	Jan. 11, 1907	Jan. 18, 1907.	1908
Pleasant Ridge ....	U. G. Senour, M. D..	Jan. 3, 1907	Jan. 15, 1907.	1908
Pleasantville .....	W. I. Winegarner....	Jan. 21, 1907	Feb. 4, 1907.	1908
Plymouth .....	Dr. George J. Searle.	Feb. 1, 1906	Feb. 6, 1906.	1907
Pomeroy .....	.....	.....	.....	.....
Portage .....	Elmer D. Quaintance.	Nov. 20, 1905	Dec. 4, 1905.	1907
Port Jefferson .....	Dr. D. J. Cargill....	Feb. 4, 1907	.....	1909
Potsdam (See New Lebanon) .....	.....	.....	.....	.....
Prairie Depot P. O. (See Freeport) ...	.....	.....	.....	.....
Quincy .....	Dr. N. V. Speece....	Jan. 7, 1907	Jan. 18, 1907.	1908
Racine .....	Dr. John Philson....	Jan. 15, 1906	Feb. 3, 1906.	1907



## HEALTH OFFICERS APPOINTED BY COUNCIL — Continued.

Village.	Name.	Appointed.	Approved.	Term expires 2d Monday in January.
Rarden .....	J. W. Newman.....	Dec. 29, 1906	Jan. 18, 1906.	1908
Rendville .....	Wm. H. Shelton.....	Jan. 22, 1907	Feb. 23, 1907.	1908
Republic .....	C. J. Spencer.....	Dec. 7, 1906	Dec. 18, 1906.	1909
Reynoldsborg .....	B. F. Orem.....	Mar. 24, 1905	Mar. 28, 1905.	1907
Rising Sun .....	N. P. Wirebaugh.....	Jan. 21, 1907	Jan. 24, 1907.	1908
Ripley .....	Dr. A. W. Francis....	Jan. 17, 1906	Jan. 24, 1906.	1907
Rochester .....	Jno. T. Henderson, M. D. ....	Mar. 6, 1905	Apr. 19, 1905.	1908
Rock Creek .....	B. C. Carpenter.....	Jan. 9, 1906	Jan. 25, 1906.	1907
Rockport (West Park P. O., Kamm's P. O.) .....	Chas. L. Wood, M. D., Lakewood .....	Jan. 22, 1907	†	1908
Rocky Ridge .....	John Krehmke .....	Feb. 26, 1906	Mar. 26, 1906.	1908
Rocky River .....	Dr. Charles L. Wood, Lakewood .....	Feb. 16, 1906	Mar. 16, 1906.	1907
Rogers .....	D. M. Miller.....	May 7, 1906	May 16, 1906.	1907
Roscoe .....	J. S. Reed.....	Feb. 21, 1905	Mar. 22, 1905.	1907
Roseville .....	Dr. O. M. Norman....	Jan. 8, 1907	Feb. 23, 1907.	1908
Rossville (Roosburg P. O.) .....	D. H. Brown.....	Dec. 21, 1906	Feb. 9, 1907.	1909
Rushville .....	Dr. W. C. Lewis.....	May 1, 1905	June 12, 1905.	1907
Sabina .....	George C. Barnes.....	Jan. 8, 1907	Jan. 18, 1907.	1908
St. Bernard .....	Dr. Jacob W. Thiel....	Jan. 16, 1907	Jan. 24, 1907.	1908
St. Clairsville .....	Dr. Samuel L. West....	May 1, 1905	May 8, 1905.	1908
St. Johns .....	E. L. Blank.....	Jan. 1906	Jan. 9, 1906.	1907
St. Paris .....	Dr. H. Resh Zeller....	Jan. 9, 1907	Feb. 4, 1907.	1908
Salesville .....	John D. McGatt.....	Jan. 17, 1907	.....	1909
Salineville .....	Dr. H. M. Calvin.....	Dec. 31, 1907	Jan. 4, 1907.	1908
Sarahsville .....	H. J. Oliver.....	Dec. 31, 1906	Jan. 9, 1907.	1908
Savannah .....	Timothy Stinebring ..	June 5, 1905	Aug. 2, 1905.	1908
Senecaville .....	Richard Lowry .....	Jan. 23, 1907	Jan. 28, 1907.	1908
Seven Mile .....	C. B. Wilson.....	Jan. 7, 1907	Feb. 5, 1907.	1908
Shanesville .....	Charles E. Black.....	Feb. 4, 1907	Feb. 23, 1907.	1908
Shawnee .....	David T. Harris.....	Jan. 2, 1906	Jan. 27, 1906.	1907
Shiloh .....	Dr. N. P. McGay.....	Jan. 14, 1907	Jan. 18, 1907.	1908
Shreve .....	John C. Manson.....	Feb. 4, 1907	Feb. 6, 1907.	1908
Silverton .....	Dr. A. A. Sprague....	Jan. 18, 1906	Jan. 31, 1906.	1907
Sinking Springs ....	Jno. W. Hite.....	Apr. 2, 1906	Apr. 11, 1906.	1907
Smithville .....	W. G. Zimmerman....	Jan. 28, 1907	Feb. 23, 1907.	1909
Somerville .....	John B. A. Robertson.	Jan. 15, 1907	Feb. 4, 1907.	1908
South Charleston ...	Jason Mercer .....	Jan. 15, 1907	Jan. 29, 1907.	1908
South Point .....	Dr. C. Wayne McCoy..	Jan. 18, 1906	Jan. 31, 1906.	1907
South Webster .....	S. S. Ferguson.....	Feb. 5, 1906	Apr. 11, 1906.	1907
South Zanesville ....	F. R. Bowers.....	Jan. 28, 1907	Feb. 23, 1907.	1908
Spring Hills .....	Oliver H. Eby.....	Jan. 29, 1907	Feb. 23, 1907.	1908
Spring Valley .....	Dr. R. W. Smith.....	Jan. 14, 1907	Feb. 4, 1907.	1908
Stockport .....	Dr. T. J. Lyne.....	Mar. 6, 1905	Apr. 13, 1905.	1907
Struthers .....	Arthur L. Jones.....	Jan. 9, 1907	Jan. 15, 1907.	1908
Stryker .....	John E. Meek.....	July 31, 1905	Oct. 16, 1905.	1909

† Appointed by the State Board of Health.

## HEALTH OFFICERS APPOINTED BY COUNCIL—Concluded.

Village.	Name.	Appointed.	Approved.	Term expires 2d Mon- day in January.
Sugar Grove .....	Dr. T. R. Mason.....	Feb. 4, 1907	Feb. 12, 1907.	1908
Sycamore .....	Dr. Isaiah B. Gibbs..	Jan. 21, 1906	Mar. 9, 1906.	1908
Sylvania .....	A. E. Stow.....	May 6, 1905	May 22, 1905.	1907
Tarleton .....	W. A. Leist.....	Jan. 25, 1907	Feb. 5, 1907.	1909
Thornville .....	O. J. Stevens.....	Jan. 7, 1907	Feb. 8, 1907.	1908
Tiltons ville P. O. (See Grover) .....				
Tontogany .....	Dr. Thos. A. Bicker- stoph .....	Feb. 23, 1904	Mar. 9, 1904.	1907
Toronto .....	John Wellington, Sr..	Aug. 15, 1905	Aug. 18, 1905.	1907
Trimble .....	Arthur W. Dean.....	Jan. 15, 1907	Jan. 17, 1907.	1908
Trotwood .....	Joseph B. Brandt.....	Feb. 7, 1907	Feb. 23, 1907.	1908
Tuscarawas .....	John W. Wood.....	Nov. 28, 1905	Dec. 7, 1905.	1908
Unionville Center ..	Dr. C. O. McCune.....	Feb. 11, 1907	Feb. 26, 1907.	1908
Uniopolis .....	Dr. J. W. Logan.....	Jan. 2, 1907	Jan. 22, 1907.	1908
Upper Sandusky ....	Dr. G. O. Maskey.....	Feb. 18, 1907	Feb. 23, 1907.	1908
Vandalia .....	Dr. W. H. Riley.....	Jan. 15, 1906	Feb. 8, 1906.	1907
Vinton .....	C. W. Matthews.....	Jan. 7, 1907	Feb. 4, 1907.	1908
Washington .....	S. B. Lawrence.....	May 7, 1906	June 2, 1906.	1908
Washingtonville ....	Dr. S. V. Kennedy....	Jan. 8, 1907	Jan. 18, 1907.	1908
Wellington .....	Dr. R. G. Holland....	Feb. 5, 1906	Feb. 23, 1906.	1908
West Alexandria ....	John P. Stock.....	Feb. 5, 1906	Feb. 10, 1906.	1908
West Carrollton ....	Frank E. Hinkson....	Jan. 17, 1905	Jan. 26, 1905.	1906
West Farmington ....	F. W. Ogram.....	Aug. 1, 1905	Aug. 10, 1905.	1907
West Liberty .....	Dr. G. B. Hale.....	Jan. 25, 1907	.....	1908
West Manchester ....	George M. Hapner....	June 11, 1906	June 27, 1906.	1908
West Mansfield (Lo- gan Co.) .....	Dr. H. A. Skidmore..	Feb. 4, 1907	Feb. 6, 1907..	1908
West Salem .....	Dr. J. W. Ferguson..	Jan. 18, 1907	.....	1908
West Unity .....	Joseph Fisher .....	July 6, 1905	July 17, 1905.	1908
Whitehouse .....	John F. Lehman.....	May 5, 1904	Sept. 6, 1904.	1907
Williamsburg .....	Dr. G. L. Hines.....	Jan. 14, 1907	.....	1909
Willshire .....	Dr. Sam'l K. Christy.	Jan. 7, 1907	Jan. 15, 1907.	1908
Winchester .....	Dr. C. S. Corboy.....	Jan. 2, 1906	Jan. 31, 1906.	1907
Worthington .....	Charles E. Wilson....	May 8, 1906	May 16, 1906.	1908
Yorkshire .....	C. E. Russell.....	Feb. 5, 1907	Feb. 23, 1907.	1908
Zanesfield .....	P. P. Outland.....	Feb. 4, 1907	.....	1908
Zoar .....	Frank Ackerman .....	Jan. 7, 1907	Jan. 18, 1907.	1908

## HEALTH OFFICERS OF CITIES AND VILLAGES.

Place.	Health Officer.
Aberdeen .....	Dr. S. A. Laughlin.
Ada .....	W. H. Morrow.
*Adamsville .....	Geo. W. McDowell.
*Addyston .....	Dr. J. H. Haire.
Adelphi .....	W. S. Koch.
*Agosta P. O. (New Bloomington)...	W. H. Carey.
Akron .....	Dr. A. A. Kohler.
Albany .....	Dr. A. F. Holmes.
*Alexandria .....	H. A. Parsons.
Alger .....	Dr. U. P. L. Vermillion.
Alliance .....	Dr. J. C. Temple.
Alvordton .....	Dr. T. E. Schrider.
Amanda .....	Geo. Boerstler.
*Amelia .....	Dr. Homer C. Behymer.
Amesville .....	J. C. Snedeker.
Andover .....	Dr. F. L. Sargent.
*Anna ....	Dr. D. R. Millette.
*Ansonia .....	Dr. J. C. Poling.
*Antioch .....	Dr. D. W. Lowe.
*Antwerp .....	Charles A. Herzer.
*Apple Creek .....	Dr. A. A. Reinhardt.
*Arcadia .....	W. W. Moore.
Arcanum ..	James A. Wallace.
Archbold .....	August Rühley.
Arlington .....	Solomon Bates.
*Arlington Heights .....	H. R. Veddern.
Arnettville (Pittsburg P. O.).....	Dr. J. O. Starr.
*Ashland .....	E. A. Kauffman.
*Ashlev .....	Rodman P. Welch.
Ashtabula .....	Dr. A. W. Hopkins.
Ashville .....	John Johnson.
*Athalia .....	Wm. H. Wylie.
Athens .....	Dr. J. M. Higgins.
*Attica .....	Dr. C. A. Force.
Avon .....	Dr. John R. Pipes.
*Bainbridge .....	Dr. W. W. Davis.
Bairdstown .....	A. W. Solomon.
Baltic .....	John Hoobler.
Baltimore .....	L. K. Davis.
*Barberton .....	Dr. Bert Rodenbaugh.
Barnesville .....	W. T. Evans.
Barnhill .....	John Stevenson.
Batavia .....	C. H. Crane.
Batesville .....	George Lashley.

\* In lieu of board of health.

Place.	Health Officer.
*Bay (West Dover P. O.).....	Geo. L. Osborn.
Beach City .....	Theodore F. Stamm.
Beallsville .....	Dr. O. M. Keesor.
*Beaver .....	Dr. E. B. Schrock.
Beaver Dam .....	Dr. J. H. Haines.
Bedford .....	Thos. E. Mathews.
Bellaire .....	Dr. D. W. Boone.
Bellbrook .....	R. M. Martz.
Belle Centre .....	W. G. Oliphant.
Bellefontaine .....	Dr. J. S. Deemy.
*Belle Valley .....	C. E. Henry.
Belleville .....	Dr. J. W. Kelly.
Bellevue .....	Dr. J. F. Miller.
Belmont .....	Jas. A. Burson.
Belmore .....	Dr. G. B. Adrian.
Beloit .....	R. H. Oswalt.
Belpre .....	Jesse McGrew.
Benton Ridge .....	Dr. R. D. Whisler.
Berea .....	A. A. Smith.
*Berlin X Roads.....	Henry Davis.
*Berlin Heights .....	Dr. G. W. Hine.
*Berne P. O. (Carlisle).....	W. R. Bromhall.
*Bethel .....	Dr. W. E. Thompson.
*Bettsville .....	C. G. Norton.
Beverly .....	B. F. Jackson.
*Blakeslee .....	Jas. B. Lauchlen.
*Blanchester .....	U. B. Chambers.
Bloom Center .....	Dr. O. C. Wilson.
*Bloomdale .....	G. W. Urie.
Bloomfield (Bloomingdale P. O.)....	E. R. Blackburn, Clerk.
*Bloomingburg .....	H. W. Worrell.
Bloomington P. O. (Bloomfield)....	E. R. Blackburn, Clerk.
Bloomville .....	D. W. Fellers.
Bluffton .....	Dr. John J. Sutter.
*Bolivar .....	Conrad H. Lebold.
Boston (See Owensville P. O.)	
*Botkins .....	James McManamy.
Bourneville .....	Dr. J. A. Van Winkle.
*Bowerston .....	H. Karn.
Bowersville .....	J. E. Steward.
Bowling Green .....	John Troxel.
*Bradford .....	H. J. McKinney.
*Bradner .....	O. J. Mitchell.
*Bratnahl .....	J. G. Newkirk.
*Bremen .....	Dr. F. P. Strayer.
*Bridgeport .....	Dr. D. V. Wagener.
Brilliant .....	A. McIntire.
*Brinkhaven P. O. (Gann).....	David C. Cunningham.
Brooklyn P. O. (South Brooklyn)....	R. E. Stickney.
*Brooklyn Heights .....	Joseph E. Richardson.
Brookville .....	Dr. H. W. McMillen.

\* In lieu of board of health.

Place.	Health Officer.
*Broughton .....	J. L. Boroff.
Bryan .....	August Heidley.
Buchtel .....	A. P. Lee, M. D.
Buckeye City .....	F. M. Welker.
Buckland .....	Dr. R. W. Sharp.
Bucyrus .....	Dr. A. H. McCrory.
Buffalo.....	Charley Frye.
Burbank .....	A. W. Hoffman.
Burkettsville .....	Dr. B. G. Inman.
Burton .....	Dr. A. D. Warner.
*Butler .....	E. E. Staunton.
*Butlerville .....	Elias Smith.
*Byesville .....	John W. Geary.
*Cadiz .....	Dr. William H. Lemmon.
Calais .....	.....
*Caldwell .....	Dr. J. L. Gray.
Caledonia .....	Noah Lee.
Cambridge .....	T. C. Stanley.
*Camden .....	Dr. W. E. Pryor.
Canal Dover .....	H. H. Prince.
Canal Fulton .....	Jeremiah L. O'Connor.
*Canal Winchester .....	J. W. Shook.
Canfield .....	J. C. Starr.
*Cannelville .....	R. T. Homman.
Canton .....	Dr. A. V. Smith.
*Cardington .....	Dr. W. A. Smith.
*Carey .....	Joseph F. Wonder.
Carlisle (See Berne P. O.)	
Carroll .....	Dr. H. A. Brown.
Carrollton .....	Dr. A. H. Hise.
*Carthage .....	Samuel B. Gilchrist.
*Casstown .....	Dr. W. W. Baker.
Catawba .....	Dr. J. D. Thomas.
*Cecil .....	Dr. S. E. Demuth.
Cedarville .....	Ray McFarland.
Celina .....	Dr. Joseph Sager.
Centerburg .....	L. B. Evans.
*Centerville .....	Dr. B. W. Dudley Kever.
Centerville (See Thurman P. O.)	
*Chagrin Falls .....	D. A. Groves.
*Chambersburg (See Eureka P. O.)...	
*Chardon .....	Harvey L. Williams.
*Chatfield .....	Samuel Lutz.
*Chester Hill .....	E. P. Worrell.
*Chester ville .....	Dr. J. D. Varney.
*Cheviot .....	Charles Craig.
Chicago Junction .....	Dr. A. R. Kauffman.
*Chickasaw .....	H. S. Schaefer.
Chillicothe .....	Edward F. Waddle.
Cincinnati .....	Dr. Samuel E. Allen.
Circleville .....	J. J. Egan.

\* In lieu of board of health.



Place.	Health Officer.
Clarington .....	C. T. Reilly.
*Clarksburg .....	J. E. Johnson.
*Clarksville .....	Perry Wilson.
Cleveland .....	Dr. Martin Friedrich.
*Cleveland Heights (Hamlet) .....	Dr. W. E. Shackleton.
*Clevess .....	Dr. W. C. Hughes.
Clifton .....	Dr. David E. Spahr.
Clinton (See Fitchville P. O.) .....	
*Cloverdale .....	Dr. J. E. Stephan.
Clyde .....	F. G. Tuttle.
Coal Grove .....	Dr. W. M. Shattuck.
*Coalton .....	J. C. Duncan.
Coldwater .....	Dr. C. F. Bollman.
*College Corner .....	J. Emery Paxton.
College Hill .....	J. E. Deininger.
Collinwood .....	Dr. C. W. McClenehan.
Columbiana .....	J. D. Holloway.
Columbus .....	Dr. Elmer G. Horton.
*Columbus Grove .....	John A. Downard.
*Commercial Point .....	Thomas McHale.
Congress .....	L. O. Weiler.
Conneaut .....	Dr. O. N. Warner.
*Continental .....	W. J. Conklin.
*Convoy .....	Dr. C. D. Sidle.
Coolville .....	Dr. A. M. Frame.
Copley .....	
*Corning .....	Wm. Anderson.
Cortland .....	Dr. B. G. McCurley.
*Corwin .....	Jacob I. Clark.
Coshocton .....	W. B. Miller.
Covington .....	Wm. E. Westfall.
Crestline .....	Dr. C. A. Marquart.
*Creston .....	Chas. A. Mellen.
Cridersville .....	F. L. Newcomer.
Crooksville .....	F. G. Albee.
*Croton P. O. (Hartford) .....	Dr. C. B. Hempstead.
*Crown City .....	J. V. Stevers.
*Cumberland .....	J. T. Aiken.
*Custar .....	Dr. H. Mannhardt.
*Cuyhoga Falls .....	W. W. Schupholm.
Cygnets .....	Thomas O. Fickel.
*Dalton .....	Dr. J. Coleman Haney.
Danville .....	Dr. T. E. Jefferson.
Darbyville .....	M. N. Bowman.
Dayton .....	Dr. Frank W. Murphy.
Deavertown .....	Theodore Welch.
Deerfield (See So. Lebanon P. O.) .....	
Deersville .....	W. C. Birney.
Defiance .....	Dr. J. D. Westrick.
*DeGraff .....	John W. Hendershott.
Delaware .....	Dr. F. L. Gage.

\* In lieu of board of health.

Place.	Health Officer.
*Delhi .....	C. B. Davis.
*Dell Roy .....	S. W. Snee.
*Delphos .....	Dr. Ezra Burnett.
Delta .....	Geo. A. Everett.
Dennison .....	Dr. L. H. Hughes.
*Deshler .....	Isaac Collins.
*Dexter City .....	Dr. E. E. Coborn.
*Dillons (Cannellville P. O.) .....	R. T. Homman.
Dillonvale .....	Dr. M. D. Barkhurst.
Donnelsville .....	Dr. Horace Heistand.
*Doylestown .....	Frank De Nise.
Dresden .....	C. W. Carter.
*Dublin .....	Newton J. Dominy.
*Dunkirk .....	Dr. C. C. McLaughlin.
*Dupont .....	J. A. Myers.
East Cleveland .....	.....
East Fairfield .....	Dr. G. H. Albright.
East Liverpool .....	Dr. C. B. Ogden.
East Palestine .....	Dr. C. E. Johnston.
*East Springfield .....	Dr. H. L. Fiscus.
*Eaton .....	Geo. W. Jones.
Edgerton .....	Dr. C. Hathaway.
*Edison .....	Dr. Jno. H. Jackson.
Edon .....	H. F. Alwood.
Eldorado .....	Geo. W. McCoy.
Elgin .....	Dr. L. P. Jackson.
Elida .....	Dr. S. A. Hitchcock.
Elmore .....	Dr. S. F. Dromgold.
Elmwood Place .....	Dr. E. T. Busching.
Elyria .....	Dr. George E. French.
Empire .....	John Hunter.
Enon .....	Frank Pappert.
*Euclid .....	P. J. Cooney.
*Eureka P. O. (Chambersburg) .....	Dr. W. J. Fletcher.
*Fairfield .....	Z. T. Hebble.
Fairmount (Hamlet) .....	Mr. L. Hunter, Clerk.
*Fairport Harbor .....	J. H. Werbeach.
Fairview .....	C. M. Ault.
*Farmersville .....	Henry Oldfather.
*Fayette .....	Benjamin Stoner.
*Fayetteville .....	Dr. F. A. Johnson.
*Felicity .....	Chas. N. Crawford.
*Fernbank .....	James E. Hickman.
Findlay .....	Amos Beardsley.
Fitchville P. O. (Clinton) .....	S. M. Sly.
Fletcher .....	Dr. J. B. Barker.
Florida .....	Wm. Thompson.
*Flushing .....	George Wheeler.
Forest .....	John Handchy.
Fort Jennings .....	Ferd Heising.
Fort Recovery .....	J. M. Buchanan.

\* In lieu of board of health.

Place.	Health Officer.
Fostoria .....	W. N. Caldwell.
*Frankfort .....	John A. Davis.
*Franklin .....	John B. Miller.
*Frazeysburg .....	John W. Blizzard.
Fredericksburg .....	Dr. W. H. Merriam.
Fredericktown .....	Dr. J. H. Norrick.
*Freeport .....	Stewart Ferrell.
Freeport (See Prairie Depot P. O.)	
Fremont .....	Dr. O. C. Vermilya.
Fultonham P. O. (Uniontown).....	Dr. C. J. Axline.
Gahanna .....	D. L. Stygler.
Galion .....	Dr. H. H. Hartman.
Gallipolis .....	Chas. B. Robinson.
Gambier .....	Dr. A. D. Welker.
Gann (Brinkhaven P. O.).....	.....
*Garrettsville .....	Dr. Geo. R. French.
Geneva .....	Dr. F. C. Smith.
*Genoa .....	Geo. W. Wright.
*Georgetown .....	Samuel F. Walker.
Germantown .....	Samuel A. Bousman.
*Gettysburg .....	Dr. John Emerson Monger.
*Geyer .....	Thos. H. Irwin.
Gibsonburg .....	J. P. Tierney.
Gilboa .....	Dr. Bruce Snodgrass.
Girard .....	Dr. W. S. Thompson.
Glandorf .....	Dr. H. M. Northam.
*Glendale .....	Clifford Allen.
Glenmont .....	A. L. Jones.
*Glouster .....	David Dille.
*Gnaddenhutten .....	L. S. Winsch.
Good Hope .....	D. C. Somers.
*Gordon .....	H. Z. Silver.
*Grafton .....	John Cahill.
*Grand Rapids .....	L. L. Mowan.
Grand River P. O. (Richmond).....	H. S. Barton.
*Grandview Heights .....	Dr. McKendree Smith.
Granville .....	Dr. C. B. Evans.
Gratis P. O. (Winchester).....	Fred Boesenberg.
Graysville .....	W. E. Barker.
*Green Camp .....	G. W. Collins.
*Greenfield .....	Taylor Neff.
Green Spring .....	Dr. R. D. Reynolds.
Greenville .....	Dr. Geo. W. Burnett.
Greenwich .....	J. H. Baker.
*Grove City .....	Samuel Douglas.
Groveport .....	Dr. C. R. Clement.
Grover (See Tiltonville P. O.)	
*Grover Hill .....	G. W. Morris.
Hamden Junction .....	H. R. Foose.
Hamersville .....	.....
Hamilton .....	Dr. Mark Millikin.

\* In lieu of board of health.

Place.	Health Officer.
Hamler .....	George Bell.
Hanging Rock .....	C. C. Farmer.
*Hanover .....	Dr. D. O. Roberts.
Hanoverton .....	Newton Steller.
*Harrisburg .....	Mason Sealock.
Harrison .....	George Campbell.
Harrisville .....	W. C. Toland.
*Harrod .....	John Blair.
*Hartford (Croton P. O.) .....	Dr. C. B. Hempstead.
Hartwell .....	H. G. Gould.
*Harveysburg .....	Dr. Samuel Jasper Ellison.
*Haskins .....	Asher S. DeMuth.
*Haviland .....	Dr. Myron A. Hanna.
*Hebron .....	Dr. George N. Brown.
Hayesville .....	Dill Address.
Hemlock .....	Dr. R. W. Miller.
Herring P. O. (Lafayette) .....	Dr. N. Sager, Jr.
Hicksville .....	J. W. Conner.
*Higginsport .....	F. M. Cahill.
Highland P. O. (New Lexington) .....	
*Hilliards .....	Dr. C. S. Latham.
Hillsboro .....	Dr. J. D. McBride.
Hiram .....	Dr. F. H. Hurd.
*Holgate .....	Adam Kemmer.
*Hollansburgh .....	Dr. A. W. Meek.
Holloway .....	L. J. Frizzell.
Holmesville .....	C. W. McClelland.
Home City .....	Dr. B. F. Lehman.
*Hopedale .....	Dr. Elmer T. Kuhn.
*Hoytville .....	H. W. Mason.
Hubbard .....	Dr. W. S. Bond.
Hudson .....	Dr. H. C. Coolman.
*Huntsville .....	Dr. G. W. Jones.
*Huron .....	Robert Day.
*Irondale .....	Howell Williams.
Ironton .....	Dr. E. E. Wells.
Ithaca .....	Dr. J. C. Hamilton.
Jackson .....	Dr. W. H. Schillenger.
Jacksonboro .....	Mr. John Stamm.
*Jackson Center .....	Dr. A. V. Derr.
Jacksonville .....	Dr. C. Von Scheele.
Jamestown .....	Harry C. Lieurance.
*Jefferson .....	W. D. Andrews.
*Jeffersonville .....	Wm. S. Reid.
Jenera .....	C. H. Heldman.
*Jeromeville .....	George Schroll.
Jerry City .....	Austin Van Blarcum.
Jerusalem .....	J. A. Latham.
*Jewett .....	T. F. Beckett.
Johnsonville .....	E. C. Hitchcock.
Johnstown .....	Dr. J. N. Wright.

\* In lieu of board of health.

Place.	Health Officer.
Junction City .....	Dr. F. G. Crosbie.
*Kalida .....	Henry Recker.
Kelley's Island .....	Geo. P. Schardt.
*Kennedy P. O. (Kennedy Heights)...	Geo. Rome.
Kent .....	James Armstrong.
Kenton .....	John M. Ellis.
*Kettlerville .....	Dr. O. O. Lemaster.
Killbuck .....	Dr. Emil J. Heinig.
Kimbolton .....	F. M. Fowler.
Kingston .....	D. B. Golden.
Kirby .....	Dr. E. E. Burns.
*Kossuth .....	Wm. Earhart.
Lafayette (See Herring P. O.)	
LaGrange .....	Dr. J. W. Lindsey.
Lakeside .....	Dr. O. L. Mapes.
*Lakeview .....	E. D. Carr.
Lakewood .....	Dr. A. E. McClure.
Lancaster .....	Geo. W. O'Grady.
*Larue .....	G. A. L. Markwith.
Latty .....	Robert Higginbotham.
*Laura .....	Chas. O. Hall.
Laurelville .....	Dr. W. D. Cain.
Lebanon .....	Dr. A. W. Mardis.
Leesburg (See Leesville P. O.)	
Leesburg .....	Dr. R. E. Holmes.
*Leesville P. O. ....	A. R. Morrison.
Leetonia .....	Dr. S. R. McCready.
Leipsic .....	Dr. John C. McClung.
Lewisburg .....	A. N. Cox.
Lewisville .....	V. E. Dillon.
*Lexington .....	Dr. J. P. Stober.
Liberty Center .....	D. K. Bowker.
Lima .....	Dr. A. L. Jones.
*Limaville .....	T. T. Arnold.
*Lindsey .....	Dr. Wm. E. Higbie.
*Lisbon .....	David H. Eells.
*Lithopolis .....	Dr. J. O. Stout.
*Lockbourne .....	Leon Harrison.
Lockington .....	Dr. J. Robert Caywood, Clerk.
*Lockland .....	Peter Butchart.
*Lodi .....	Henry Selders.
*Logan .....	Dr. M. H. Cherrington.
*London .....	Dr. W. H. Christopher.
Lorain .....	Dr. Edw. V. Hug.
Loramie .....	Dr. Thomas Walkup.
*Lore City .....	Joseph Todd.
Loudonville .....	Walter S. Young.
Louisville .....	Dr. R. G. Walker.
*Loveland .....	Dr. F. H. Leever.
Lowell .....	Peter Rouch.
*Lowellville .....	Chas. M. Clarke.

\* In lieu of board of health.



Place.	Health Officer.
Lower Salem .....	J. P. Hartshorn.
*Lucas .....	Wm. Baer.
*Lynchburg .....	W. H. McClelland.
*Lyons .....	Dr. Thomas Blair.
*McArthur .....	Dr. Edgar F. Collins.
McClure .....	E. E. Britton.
*McComb .....	James H. Byal.
McConnelsville .....	Wm. Dille.
McGuffey .....	Dr. J. B. K. Evans.
Macedonia .....	P. B. Seacoy.
*Macksburg .....	O. S. Gilchriest.
*Madison .....	Dr. S. D. Good.
Madisonville .....	Dr. C. L. Metz.
Magnetic Springs .....	Dr. M. B. Newhouse.
Magnolia .....	Mr. Charles Kemp.
*Maineville .....	J. G. Trimble.
Malinta .....	Chas. Crockett.
Malta .....	W. R. Scott.
Malvern .....	Dr. John A. Rhiel.
Manchester .....	Dr. R. A. Stephenson.
Mansfield .....	Dr. John M. Burns.
Mantua .....	C. R. Chapin.
Marblehead .....	L. M. Clemons.
*Marengo .....	J. E. Eakins.
Marietta .....	Dr. F. S. McGee.
Marion .....	James P. Lutz.
*Marseilles .....	Dr. E. S. Jones.
*Marshallville .....	E. P. Willford.
*Martinsburg .....	Dr. N. S. Toland.
Martins Ferry .....	Dr. John Johns.
Martinsville .....	John F. Wells.
*Marysville .....	Dr. C. W. Hoopes.
Mason .....	Dr. M. H. Houseworth.
Massillon .....	Dr. T. Clarke Miller.
*Maumee .....	Phillip Hartman.
Mechanicsburg .....	Dr. J. C. Hathaway.
*Medina .....	F. C. Harding.
*Melrose .....	T. J. Myers.
*Mendon .....	S. C. Lemunyon.
*Mentor .....	Dr. J. W. Lowe.
Metamora .....	Mr. Augustus Reis.
Miamisburg .....	Dr. A. H. Blossom.
Middleburg .....	C. C. Heath.
Middle Point .....	J. R. Swaney.
Middleport .....	Dr. David Sisson.
Middletown .....	Dr. Geo. D. Lummis.
Midland (See Midland City P. O.)	
Midland City P. O. ....	Dr. Leonidas Boulware.
Midway (See Sedalia).	
*Mifflin .....	Dr. Jas. H. S. Hutchison.
*Milan .....	Geo. W. Curtis.

\* In lieu of board of health.

Place.	Health Officer.
*Milford .....	Dr. Con W. Gatch.
*Milford Centre .....	Martin Frye.
Millbury .....	Dr. C. M. Diebert.
Milledgeville .....	Dr. W. T. Mathews.
*Miller City .....	Dr. R. J. Dillery.
Millersburg .....	Mr. Chas. A. Estill.
Milton Center .....	Dr. J. F. Noble.
*Miltonsburg .....	Dr. Chas. Keyser.
Mineral City .....	C. C. White.
Mineral Ridge .....	Dr. J. M. Elder.
*Minerva .....	Elmer E. Fultz.
*Mingo Junction .....	Dr. W. W. McMillan.
*Minster .....	C. H. Dickman.
*Mogadore .....	Edward E. Bixler.
Monroeville .....	Dr. E. R. Kreider.
*Montezuma .....	George Stafford.
Montpelier .....	Dr. J. V. Lesnet.
*Morristown .....	A. M. Poole.
*Morrow .....	Dr. Leonard Mounts.
Moscow .....	Dr. W. S. Purkhiser.
Mt. Blanchard .....	Samuel E. Moore.
Mt. Cory .....	Mr. Jacob Doty.
*Mt. Eaton .....	Dr. C. N. Clark.
*Mt. Gilead .....	Dr. G. H. Pugh.
*Mt. Healthy .....	Dr. Lafayette Newfarth.
*Mt. Orab .....	Dr. C. H. Matthews.
Mt. Pleasant .....	Henry B. Mercer.
*Mt. Sterling .....	Dr. Robert Leach.
Mt. Vernon .....	Dr. H. W. Blair.
Mt. Victory .....	Dr. B. B. Morrow.
*Mt. Washington .....	Dr. W. C. Langdon.
Murray City .....	Dr. T. J. Dillinger.
Mutual .....	C. M. Goul.
Napoleon .....	D. H. Hancock.
*Nashville .....	David Parks.
Navarre .....	John Bailiss.
Nelsonville .....	N. Hill.
*Nevada .....	Dr. S. S. Barrett.
Neville .....	F. M. Neal.
New Albany .....	Christopher Horlocker.
*New Alexandria .....	Dr. C. E. Gourley.
Newark .....	Dr. Clark B. Hatch.
New Athens .....	Dr. A. B. Tubbs.
New Bloomington (See Agosta P. O.)	
New Boston .....	Arthur Rutter.
*New Bremen .....	Dr. E. M. Phelps.
Newburgh .....	Dr. C. L. McCoy.
Newburgh Heights (See Willow P. O.)	
*New Carlisle .....	V. B. Littleton.
New Comerstown .....	Wm. Tidrick.
*New Concord .....	Dr. J. Milton O'Neal.

\* In lieu of board of health.

Place.	Health Officer.
*New Holland .....	John Morris.
New Knoxville .....	Dr. H. E. Fledderjohann.
*New Lebanon (Montgomery Co.) ....	Lutie B. Piatt.
*New Lebanon (See Potsdam P. O.)	
New Lexington (See Highland P. O.)	
*New Lexington .....	J. W. Holden.
New London .....	Wm. H. Whitney.
*New Madison .....	Wm. B. Harter.
*New Matamoras .....	J. R. Johnson.
*New Paris .....	Dr. G. L. Lyne.
New Philadelphia .....	Dr. Geo. H. Peck.
New Richmond .....	Dr. J. A. Windsor.
*New Riegel .....	Anthony Brickner.
*New Salem .....	Dr. F. C. Adams.
*New Straitsville .....	James C. Duffy.
*Newton Falls .....	Dr. H. M. Mealey.
*Newtown .....	Dr. Thos. B. Mulloy.
*New Vienna .....	Dr. Geo. R. Conard.
*New Washington .....	Isaac Hosler.
*New Waterford .....	Thomas H. Todd.
*New Weston .....	Dr. A. Pearson.
*Ney .....	Dr. P. M. Lehman.
Niles .....	Dr. H. S. Brown.
*North Amherst .....	Dr. Washington Foster.
North Baltimore .....	Dr. J. W. Stoner.
*North Bend .....	Thomas Pearson.
North Lewisburg .....	Mr. G. L. Freeman.
North Lindale .....	Mr. Hugh Geariety.
*North Robinson .....	Mr. James E. Morton.
Norwalk .....	Mr. Louis Fiesinger.
Norwich .....	L. D. Wilson.
Norwood .....	Dr. J. C. Cadwallader.
*Nottingham .....	D. W. O. Jenks.
Oak Harbor .....	Dr. E. B. Huyck.
*Oak Hill .....	David C. Lloyd.
*Oakley .....	Dr. H. H. Schulze.
*Oakwood .....	Martin Shisler.
Oberlin .....	E. L. Burge.
Ohio City .....	G. A. Balliet.
Olmsted Falls .....	H. B. Northrop.
*Orangeville .....	Dr. R. R. Root.
Orrville .....	Dr. A. A. Brooks.
*Osborn .....	Mr. W. S. Lobaugh.
*Osgood .....	Wm. F. Davidson.
*Osnaburg .....	Dr. Aaron Busby.
*Ostrander .....	M. M. McBride.
Ottawa .....	Dr. Frank Light.
*Ottoville .....	Dr. John F. Ockuly.
*Otway .....	Simon Crow.
Owensville P. O. (Boston).....	Dr. G. G. Rutledge.
*Oxford .....	D. P. Beaton.

\* In lieu of board of health.

Place.	Health Officer.
Painesville .....	S. A. Haskell.
*Palestine .....	W. E. Kester.
Pandora .....	Dr. E. A. Ballmer.
Pataskala .....	Frank McConnaughey.
Patterson .....	Peter C. Breidenbach.
Paulding .....	Dr. Ira J. Dix.
Payne .....	Dr. G. W. Bodney.
*Peebles .....	Dr. Geo. F. Thomas.
Pemberville .....	Dr. R. J. Simon.
Peninsula .....	D. H. Billings.
Perrysburg .....	Dr. J. H. Hayes.
Perrysville .....	D. W. Webster.
Philo P. O. (Taylorsville).....	Reese Mercer.
*Pickerington .....	Thomas Tussing.
Piketon .....	Andrew Martin.
*Pioneer .....	Arthur F. Norris.
Piqua .....	Dr. F. E. Kitzmiller.
Pittsburg P. O. (Arnettsville).....	Dr. J. O. Starr.
*Plain City .....	Oran Long.
*Plainfield .....	Wesley E. Lawrence.
*Pleasant City .....	Silas W. German.
Pleasant Hill .....	Daniel Brown.
*Pleasant Ridge .....	Dr. U. G. Senour.
*Pleasantville .....	W. J. Winegarner.
*Plymouth .....	Dr. Geo. J. Searle.
Poland .....	Dr. C. R. Justice.
Polk .....	Dr. W. H. Rhinehart.
*Pomeroy .....	.....
*Portage .....	Elmer D. Quaintance.
Port Clinton .....	Dr. David Gillard.
*Port Jefferson .....	Dr. D. J. Cargill.
Portsmouth .....	Dr. W. W. Smith.
Port Washington .....	Dr. F. B. Larimore.
Port Williams (Hamlet).....	S. L. Thorpe.
*Potsdam P. O. (New Lebanon).....	Dr. D. W. Shellabarger.
Powhatan Point .....	Franz Saner.
*Prairie Depot P. O. (Freeport).....	J. W. Coy.
Proctorville .....	Dr. R. E. Atkinson.
Prospect .....	G. F. Gast.
Put-in-Bay .....	Adam Heidle.
Quaker City .....	W. W. Dowdell.
*Quincy .....	Dr. N. V. Speece.
*Racine .....	Dr. John Philson.
*Rarden .....	J. W. Newman.
Ravenna .....	Henry F. Shrader.
Rawson .....	Wm. Hoppas.
Reading .....	Leo Grau.
*Rendville .....	Wm. H. Shelton.
*Republic .....	C. J. Spencer.
*Reynoldsburg .....	B. F. Orem.
Richmond .....	Dr. Samuel Rothacker.

\* In lieu of board of health.

Place.	Health Officer.
Richwood .....	J. F. Ledley.
*Ripley .....	Dr. A. W. Francis.
*Rising Sun .....	N. P. Wirebaugh.
*Rochester .....	Dr. Jno. T. Henderson.
*Rock Creek .....	B. C. Carpenter.
Rockford .....	Geo. Kimble.
Rockport (See West Park P. O.) ....	
*Rocky Ridge .....	John Krehmke.
*Rocky River P. O. ....	Dr. Chas. L. Wood, Lakewood.
*Rogers .....	D. M. Miller.
*Rome (See Stouts P. O.)	
*Roscoe .....	J. S. Reed.
*Roseville .....	Dr. O. M. Norman.
*Rossburg P. O. ....	D. H. Brown.
Rossville (Rossburg P. O.) ....	
Rushsylvania .....	W. H. Drum.
*Rushville .....	Dr. W. C. Lewis.
Russellville .....	Dr. A. Gilfillin.
*St. Bernard .....	Dr. J. W. Theil.
*St. Clairsville .....	Dr. S. L. West.
St. Henry .....	Dr. J. A. Schirack.
*St. John .....	E. L. Blank
St. Louisville .....	Dr. L. L. Marriott.
St. Marys .....	Dr. Guy E. Noble.
*St. Paris .....	Dr. H. Rush Zeller.
*Sabina .....	Geo. C. Barnes.
Salem .....	Dr. E. J. Schwartz.
*Salesville .....	John D. McGath.
*Salineville .....	Dr. H. M. Calvin.
Sandusky .....	Dr. Wm. H. Busch.
*Sarahsville .....	H. J. Oliver.
*Savannah .....	Timothy H. Stinebring.
Scio .....	Dr. G. D. Custer.
Scott .....	H. H. Powers.
Sebring .....	Virgil B. Slater.
Sedalia (Midway, Madison Co.) ....	Dr. E. B. Mead.
*Senecaville .....	Richard Lowny.
*Seven Mile .....	C. B. Wilson.
Seville .....	Dr. P. E. Beach.
*Shanesville .....	Chas. E. Black.
Sharon .....	Mr. J. A. Reid.
*Shawnee .....	David T. Harris.
Shelby .....	Dr. Roy E. Smucker.
Sherodsville .....	Jolin Fowler.
Sherwood .....	Dr. H. C. Lindersmith.
*Shiloh .....	Dr. Norman P. McGay.
*Shreve .....	John C. Manson.
Sidney .....	Wm. C. Wyman.
*Silverton .....	Dr. A. A. Sprague.
*Sinking Spring .....	John W. Hite.
Smithfield .....	Ross C. Moore.

\* In lieu of board of health.



Place.	Health Officer.
*Smithville .....	W. G. Zimmerman.
Somerset .....	Michael Clouse.
*Somerville .....	John B. A. Robinson.
South Bloomfield .....	.....
South Brooklyn (P. O. Brooklyn)...	.....
*South Charleston .....	Jason Mercer.
South Lebanon P. O. (Deerfield)....	Dr. V. T. Reynolds.
*South Point .....	Dr. C. Wayne McCoy.
South Salem .....	George A. Basore.
South Solon .....	Dr. W. H. Queen.
*South Webster .....	S. S. Ferguson.
*South Zanesville .....	F. R. Bowers.
Sparta .....	Dr. T. A. Huggins.
Spencerville .....	G. A. Rusler.
Springborough .....	J. B. Haines.
Springfield .....	Dr. Henry Baldwin.
*Spring Hills .....	Oliver H. Eby.
*Spring Valley .....	Dr. R. W. Smith.
Steubenville .....	John Welch.
Stewart .....	Mr. G. H. Hawk.
*Stockport .....	Dr. T. J. Lyne.
Stouts P. O. (Rome).....	Dr. R. Y. Littleton.
Strasburg .....	Dr. J. C. Schutzbach.
*Struthers .....	Arthur L. Jones.
*Stryker .....	John E. Meek.
Sugar Creek .....	J. E. Kauffman.
*Sugar Grove .....	Dr. T. R. Mason.
Summerfield .....	John Baughin.
Sunbury .....	Dr. G. H. Gerhardt.
Swanton .....	B. F. Mills.
*Sycamore .....	Dr. Isaiah B. Gibbs.
*Sylvania .....	A. E. Stow.
*Tarlton .....	W. A. Leist.
*Thornville .....	O. J. Stevens.
Thurman P. O. (Centerville).....	Lewis W. Davis.
Tiffin .....	Dr. A. C. Schwartz.
*Tiltonville .....	Wm. Cunningham.
Tippecanoe City .....	F. N. Agenbroad.
Tiro .....	Dr. G. O. Blair.
Toledo .....	Dr. J. C. Reinhart.
*Tontogany .....	Dr. Thos. A. Bickerstoph.
*Toronto .....	John Wellington, Sr.
Trenton .....	Henry Fike.
*Trimble .....	Arthur H. Dean.
Trinway .....	Mr. Le Roy Rose.
*Trotwood .....	Joseph B. Brandt.
Troy .....	Dr. J. W. Means.
*Tuscarawas .....	John W. Wood.
Uhrichsville .....	Finley Johnson.
Union City .....	Francis Bourguin.
Uniontown P. O. (Fultonham)	

\* In lieu of board of health.

Place.	Health Officer.
*Unionville Center .....	Dr. C. O. McCune.
*Uniopolis .....	J. W. Logan.
*Upper Sandusky .....	Dr. G. O. Maskey.
Urbana .....	Dr. H. M. Pearce
Utica .....	A. W. Vance.
Van Buren .....	Jas. P. Grubb.
*Vandalia .....	Dr. W. H. Riley.
Vanlue .....	Dr. Jas. L. Schrote.
Van Wert .....	Dr. C. G. Church.
Venedocia .....	Dr. David Davis.
Vermilion .....	J. M. Delker.
Versailles .....	Dr. C. F. Ryan.
Vienna (See Vienna X Roads P. O.)	
Vienna X Roads P. O. ....	Dr. E. A. Dye.
*Vinton .....	C. W. Matthews.
Wadsworth .....	M. F. Miller.
Waldo .....	Dr. B. D. Osborn.
Wapakoneta .....	A. Kohler.
Warren .....	Dr. Geo. N. Simpson.
Warsaw .....	S. W. Willis.
*Washington .....	S. B. Lawrence.
Washington C. H. ....	F. M. Bateman.
*Washingtonville .....	Dr. S. V. Kennedy.
Waterloo (See Pancoastburg P. O.)	
Waterville .....	H. T. Van Fleet.
Wauseon .....	Frank Yarnell.
Waverly .....	James J. Ennitt.
Waynesburg .....	Dr. Gustav A. Shane.
Waynesfield .....	George Schneider.
Waynesville .....	Dr. J. T. Ellis.
Webster .....	J. F. Byrd.
*Wellington .....	Dr. R. G. Holland.
Wellston .....	James R. Ward.
Wellsville .....	Dr. M. C. Tarr.
*West Alexandria .....	John P. Stock.
West Cairo .....	Dr. Chas. E. Stadler.
*West Carrollton .....	Frank Hinkson.
West Elkton .....	Dr. Elwood Holaday.
Western Star .....	Fred Becker, Wadsworth R. F.
	D. 2.
Westerville .....	P. A. Conklin.
*West Farmington .....	F. W. Ogram.
West Jefferson .....	Albert Clark.
West Lafayette .....	J. T. Carter.
West Leipsic .....	Eugene Lamphear.
*West Liberty .....	Dr. G. B. Hale.
*West Manchester .....	George M. Hapner.
*West Mansfield .....	Dr. H. A. Skidmore.
West Millgrove .....	Dr. C. B. Hatfield.
West Milton .....	Dr. Gainor Jennings.
Weston .....	Dr. J. W. Williams.

\* In lieu of board of health.

Place.	Health Officer.
*West Park P. O. (Rockport).....	Dr. Chas. L. Wood, Lakewood.
West Rushville .....	Wm. Kerr.
*West Salem .....	Dr. J. W. Ferguson.
West Union .....	Dr. James W. Bunn.
*West Unity .....	Joseph Fisher.
Wharton .....	J. J. Mayer.
*Whitehouse .....	J. F. Lehman.
Wilkesville .....	Dr. G. W. Martin.
*Williamsburg .....	Dr. L. G. Hines.
Williamsport .....	Dr. D. H. Marcy.
Willoughby .....	James Maloney.
Willow P. O. (Newburg Heights)....	Dr. W. M. James.
*Willshire .....	Dr. Samuel K. Christy.
Wilmington .....	Dr. A. T. Quinn.
Wilmot .....	O. Curtis Ricksecker, M. D.
*Winchester .....	Dr. C. S. Corboy.
Winchester (Preble) See Gratis P. O.	
Windham .....	H. J. Higley.
Woodsfield .....	John Beard.
Woodstock .....	D. P. Smith.
Woodville .....	Dr. R. M. Durbin.
Wooster .....	Dr. J. W. Lehr.
*Worthington .....	Charles E. Wilson.
Wren .....	.....
Wyoming .....	George Stoddard.
Xenia .....	Dr. L. H. Brundage.
Yellow Springs .....	J. P. Funderburg.
*Yorkshire .....	C. O. Russell.
Youngstown .....	Dr. H. E. Welch.
Zaleski .....	J. W. Crist, Mayor.
*Zanesfield .....	Dr. P. P. Outland.
Zanesville .....	Dr. G. Warburton.
Zoar .....	Frank Ackerman.

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\* In lieu of board of health.

Abstracts of Reports  
OF  
DEATHS AND THEIR CAUSES.  
DURING 1906.

(465)







## ABSTRACT OF THE REPORTS OF DEATHS AND THEIR CAUSES DURING FEBRUARY, 1906.

Cities over 5,000 Population. Census 1900.	*Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Total Under One Year.	Total Under Five Years and Over One Year.	Total Zymotic Diseases.	Croup and Diphtheria.	Cholera Infantum.	Cerebro Spinal Meningitis.	Cholera Morbus.	Diarrheal Diseases.	Dysentery.	Malarial Fever.	Measles.	Puerperal Fever.	Scarlet Fever.	Tonsillitis.	Typhoid Fever.	Whooping Cough.	Total Constitutional Diseases.	Cancer.	Phthisis Pulmonalis.	Total Local Diseases.	Apoplexy.	Bright's Disease.	Bronchitis.	Convulsions.	Gastritis and Peritonitis.	Heart Disease.	Meningitis.	Pleurisy.	Pneumonia.	Total Developmental Diseases.	Total Violence.	Premature and Still Births.
Albion	50,000	7	6.22	1	1	1																													
Albion	12,500	19	15.20	2	3	3																													
Albion	12,500	15	15.00	2	3	3																													
Albion	12,500	15	15.00	2	3	3																													
Albion	12,500	15	15.00	2	3	3																													
Albion	12,500	15	15.00	2	3	3																													
Albion	12,500	15	15.00	2	3	3																													
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Albion	12,500	15	15.00	2	3	3																													
Albion	12,500	15	15.00	2	3	3																													
Albion	12,500	15	15.00	2	3	3																													
Albion	12,500	15	15.00	2	3	3																													
Albion	12,500	15	15.0																																

[illegible]

\* By health officers. † No report received.



Hamilton	30,000	50	20.00	4	6	9	1	...	...	1	...	2	2	...	3	...	11	1	3	25	...	1	3	1	...	1	...	8	3	...	9	2	3	7
Ironton	15,000	23	18.40	4	2	2	...	...	...	...	1	...	...	...	...	...	5	1	3	13	...	1	3	1	...	...	...	...	...	3	2	1	...	
Kenton	9,200	12	8.74	...	...	2	...	...	...	...	2	...	...	...	...	...	5	1	4	4	...	1	...	...	...	...	...	...	...	1	...	...	...	
Lancaster	16,470	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Lima	30,000	29	11.60	10	3	2	...	...	...	...	2	...	...	...	...	...	5	2	2	11	...	1	...	...	...	...	...	...	...	3	5	6	3	
Lorain	30,000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Mansfield	22,000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Marietta	15,380	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Marion	18,000	20	13.33	3	4	2	...	...	...	...	...	...	...	...	...	...	2	...	2	14	...	...	...	...	...	...	...	...	...	...	...	...	...	
Martins Ferry	18,000	19	22.80	...	...	...	...	...	...	...	...	...	...	...	...	...	5	5	13	1	...	1	...	...	...	...	...	...	...	...	...	...	...	
Massillon	10,000	14	11.67	3	1	1	...	...	...	...	...	...	...	...	...	...	4	1	3	8	...	2	1	...	...	...	...	...	...	...	...	...	...	
Middletown	14,000	11	11.00	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	2	9	...	1	...	...	...	...	...	...	...	...	...	...	...	
Mt. Vernon	10,000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Nelsonville	7,000	5	8.57	...	...	1	...	...	...	...	...	...	...	...	...	...	2	...	1	1	...	3	...	...	...	...	...	...	...	...	...	...	...	
Newark	28,600	30	12.63	5	...	3	...	...	...	...	...	...	...	...	...	...	8	...	2	12	...	...	...	...	...	...	...	...	...	...	...	...	...	
New Philadelphia	10,000	6	7.20	1	1	2	...	...	...	...	1	...	...	...	...	...	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	
Niles	9,000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Norwalk	9,000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Norwood	12,500	14	13.44	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	4	10	...	2	...	...	...	...	...	...	...	...	...	...	...	
Painesville	6,000	13	26.00	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	
Piqua	16,000	8	6.00	2	1	...	...	...	...	...	...	...	...	...	...	...	3	...	1	3	...	...	...	...	...	...	...	...	...	...	...	...	...	
Portsmouth	24,000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
St. Marys	5,700	6	12.63	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Salem	8,000	6	9.00	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Sandusky	26,000	20	12.00	2	...	1	...	...	...	...	...	...	...	...	...	...	3	...	1	5	...	1	...	...	...	...	...	...	...	...	...	...	...	
Sidney	6,000	5	10.00	2	...	2	...	...	...	...	...	...	...	...	...	...	6	...	1	11	...	3	...	...	...	...	...	...	...	...	...	...	...	
Springfield	45,000	43	11.47	3	3	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Stuebenville	20,000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	9	1	6	27	...	2	...	...	...	...	...	...	...	...	...	...	...	
Tiffin	13,000	11	10.15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Toledo	171,056	180	12.58	31	11	21	6	...	...	...	4	...	...	...	...	...	2	...	41	6	22	83	9	4	2	3	9	4	17	18	13	19	...	
Troy	6,436	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Urbana	7,500	9	14.40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Van Wert	8,000	9	13.50	...	...	1	...	...	...	...	...	...	...	...	...	...	2	2	2	6	...	1	...	...	...	...	...	...	...	...	...	...	...	
Warren	12,000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Washington C. H.	5,756	3	3.00	...	1	1	...	...	...	...	1	...	...	...	...	...	4	...	2	3	...	1	...	...	...	...	...	...	...	...	...	...	...	
Wellston	11,000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Wellsville	9,000	4	4.36	...	2	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Wooster	6,144	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	
Xenia	10,000	15	18.00	...	...	...	...	...	...	...	...	...	...	...	...	...	5	1	2	9	...	1	...	...	...	...	...	...	...	...	...	...	...	
Youngstown	59,441	65	13.12	16	8	11	1	...	...	...	...	...	...	...	...	...	3	1	10	33	...	1	...	...	...	...	...	...	...	...	...	...	...	
Zanesville	23,000	31	14.30	4	1	1	...	...	...	...	...	...	...	...	...	...	7	2	2	5	...	1	...	...	...	...	...	...	...	...	...	...	...	
Total	1,651,667	1,950	14.17	308	166	206	39	...	...	...	4	...	...	...	...	...	8	388	78	225	1,064	70	91	43	50	25	180	38	5	282	146	124	180	

\* By health officers. † No report received.















Hamilton	30,000	†	19	15	20	3	9	4	1	1	1	1	1	4	2	10	1	1	5	1	2												
Ironton	15,000	†	11	8	01	1	1	1	1	1	1	1	1	4	3	2	1	1	1	3	3												
Kenton	16,470	†	23	9	20	6	3	2	1	1	1	1	1	2	1	17	2	3	1	7	4												
Lancaster	30,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Lima	30,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Lorain	22,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Mansfield	15,380	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Marietta	18,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Marion	18,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Martins Ferry	10,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Massillon	14,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Middletown	12,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Mt. Vernon	10,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Nelsonville	7,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Newark	28,500	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
New Philadelphia	10,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Niles	9,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Norwalk	9,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Norwood	12,500	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Norwood	6,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Painesville	16,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Piqua	19,14	25	5	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Portsmouth	24,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
St. Marys	5,700	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Salcm	8,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Salem	7,10	50	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Sandusky	26,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Sidney	6,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Springfield	45,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Steubenville	20,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Tiffin	13,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Toledo	171,656	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Troy	6,436	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Urbana	7,570	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Van Wert	8,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Warren	12,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Washington C. H.	5,756	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Wellston	11,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Wellsville	9,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Wheeler	6,144	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Xenia	10,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Youngstown	59,441	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Zanesville	26,000	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†	†												
Total	1,592,103	†	1,539	11	60	257	145	193	15	19	6	38	3	7	2	26	8	329	88	165	736	52	62	24	46	26	138	38	4	123	120	138	191

\* By health officers. † No report received.



[illegible]

\* By health officers. † No report received.









[illegible]

\* By health officers. † No report received.



[illegible]

\* By health officers. † No report received.









Hamilton	30,000	†	22	17.60	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1</
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\* By health officers. † No report received.

## ABSTRACT OF THE REPORTS OF DEATHS

Cities.	*Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.									
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.	Dysentery.	Purulent and Septicemic Infections.
Akron	50,000	600	12.00	.....	.....	13	.....	.....	.....	.....	3	7	1	2	6
Alliance	13,500	114	8.44	7	5	2	.....	.....	.....	1	1	5	1	2	7
Ashtabula	15,000	121	8.07	.....	.....	.....	.....	.....	.....	.....	3	1	.....	.....	.....
Bellaire	12,000	150	12.50	12	9	8	.....	.....	.....	1	.....	4	1	1	5
Bellefontaine	7,611	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bowling Green	5,500	49	8.91	3	1	4	.....	.....	.....	.....	.....	1	.....	.....	.....
Bucyrus	9,000	79	8.78	11	4	1	.....	.....	.....	.....	.....	.....	1	.....	1
Cambridge	13,000	102	7.85	2	4	1	.....	.....	.....	.....	2	5	2	2	.....
Canal Dover	6,725	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Canton	40,000	422	10.55	67	34	11	.....	3	.....	.....	1	12	.....	3	9
Chillicothe	17,000	293	17.23	7	19	11	.....	.....	.....	.....	.....	3	2	.....	.....
Cincinnati	380,000	7,195	18.93	949	605	236	.....	1	61	10	11	77	62	22	20
Circleville	7,000	95	13.57	18	12	.....	.....	.....	.....	.....	.....	2	2	.....	.....
Cleveland	440,000	7,353	16.71	1,940	775	93	2	85	66	41	166	14	20	57	.....
Columbus	180,000	2,033	11.29	380	104	52	.....	10	7	6	16	4	.....	19	.....
Conneaut	8,000	91	11.37	20	2	.....	.....	2	.....	.....	2	1	.....	2	.....
Coshocton	10,000	99	9.90	12	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dayton	120,000	1,813	15.11	182	101	18	2	.....	.....	1	27	3	13	23	.....
Defiance	9,500	75	7.89	5	9	1	.....	.....	.....	.....	1	.....	.....	.....	.....
Delaware	12,000	106	8.83	.....	6	6	.....	.....	.....	1	2	5	.....	.....	.....
East Liverpool	20,000	287	14.35	.....	.....	13	1	2	1	1	10	3	1	6	.....
Elyria	14,000	145	10.36	10	9	7	.....	.....	.....	.....	1	.....	.....	.....	.....
Findlay	18,000	214	11.89	20	8	5	1	.....	.....	.....	3	1	.....	4	.....
Fostoria	9,000	112	12.44	13	5	2	.....	.....	.....	.....	1	.....	4	2	.....
Fremont	10,000	101	10.10	7	2	2	.....	.....	.....	.....	.....	1	.....	4	.....
Galion	9,500	85	8.95	16	.....	1	.....	.....	.....	.....	.....	.....	.....	1	3
Gallipolis	5,000	191	38.20	7	9	6	.....	.....	.....	.....	.....	8	.....	1	2
Greenville	7,000	68	9.71	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....
Hamilton	30,000	431	14.37	15	22	15	1	5	.....	6	3	2	.....	6	.....
Ironton	15,000	231	15.40	35	11	11	.....	.....	.....	2	1	4	.....	9	.....
Kenton	9,200	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lancaster	16,470	128	7.77	18	7	3	.....	.....	.....	.....	.....	5	.....	.....	4
Lima	30,000	321	10.70	47	18	10	3	.....	.....	2	.....	8	2	.....	7
Lorain	30,000	330	11.00	92	43	12	.....	.....	.....	3	1	6	1	1	2
Mansfield	22,000	239	10.81	36	11	3	1	.....	.....	.....	.....	1	2	1	5
Marietta	15,380	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Marion	18,000	223	12.39	14	24	2	.....	.....	1	.....	.....	2	1	1	1
Martins Ferry	10,000	133	13.30	33	11	7	.....	.....	.....	1	.....	.....	.....	.....	2
Massillon	14,400	163	11.32	29	9	1	1	.....	1	.....	1	2	.....	.....	1
Middletown	12,000	123	10.25	22	8	1	.....	.....	.....	.....	3	1	.....	.....	.....
Mt. Vernon	10,000	90	9.00	7	5	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
Nelsonville	7,000	52	7.43	14	3	1	1	.....	.....	1	.....	2	1	.....	.....
Newark	28,500	237	8.32	17	17	7	.....	.....	.....	.....	.....	4	1	1	.....
New Philadelphia	10,000	86	8.60	7	1	10	.....	.....	1	.....	.....	2	.....	2	2
Niles	9,000	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Norwalk	9,000	103	11.44	3	1	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
Norwood	12,500	116	9.28	20	1	2	.....	.....	.....	.....	1	2	.....	.....	1
Painesville	6,000	103	17.17	.....	.....	3	.....	.....	.....	.....	.....	1	1	1	.....
Piqua	16,000	175	10.94	19	18	7	.....	.....	.....	.....	1	5	.....	.....	1
Portsmouth	24,000	371	15.46	56	47	11	.....	.....	7	.....	4	5	7	6	1
St. Marys	5,700	64	11.23	9	11	.....	.....	.....	.....	2	1	.....	.....	.....	.....
Salem	8,600	83	10.37	.....	.....	1	.....	.....	.....	1	1	.....	.....	.....	.....
Sandusky	26,000	284	10.92	45	15	6	.....	.....	.....	.....	1	13	.....	1	3
Sidney	6,000	70	11.67	8	6	2	.....	.....	.....	.....	1	.....	.....	.....	.....
Springfield	45,000	625	13.89	.....	.....	16	1	.....	7	.....	1	14	.....	1	5
Staubenville	20,000	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tiffin	13,000	118	9.08	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	1
Toledo	171,656	2,036	11.86	362	169	69	.....	.....	11	9	8	48	9	3	14
Troy	6,436	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Urbana	7,500	96	12.80	3	5	2	.....	.....	.....	.....	.....	.....	2	1	2
Van Wert	8,000	90	11.25	.....	.....	1	.....	.....	.....	.....	.....	.....	1	6	.....
Warren	12,000	76	6.33	7	4	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington C. H.	5,756	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wellston	11,000	+	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wellsville	9,000	101	11.22	13	22	1	.....	.....	1	.....	2	2	.....	.....	.....



## AND THEIR CAUSES DURING 1906.

General Diseases.				Diseases of Nervous System.	Diseases of Circulatory System.	Diseases of Respiratory System.		Diseases of Digestive System.	Diseases of Genito-Urinary System.	Puerperal Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.
Pulmonary Tuberculosis.	Other Forms of Tuberculosis.	Cancer.	Rheumatism and Gout.			Pneumonia.	Other Respiratory Diseases.											
37	9	29	29	112	58	54	14	55	46	2				33	34	45	18	81
14	5	17	17	11	16	10	4	6	3	2				4	4	20		2
31	3	3	3	19	20	62	18	16	6	6				3	4	13		16
13	1	1	1	9		3	7	4	1						1	5	1	3
4	4	4	4	7	12	14	1	12	7	1					3	12		3
9	7	7	7	15	11	10	2	6	4						2	7	3	9
11																		
35	5	25	3	72	59	41	7	60	18	1	1	1		17	32	6		33
15	1	6	11	44	39	24	12	22	15	9				17	11	27	4	18
973	71	315	26	144	754	595	681	325	854	597	31	25	12	1	261	283	276	354
15	2	2		14	10	7		17	9					4	6	3		9
584	62	295	35	237	920	564	787	345	995	449	50	34	11	61	431	299	489	161
273	31	91	7	39	255	216	180	38	217	120	13	9	2	13	164	108	116	27
6	1	1	6	10	11	8	4	8	2	2				2	14	6		7
3	2	3	2	19	17	14	4	5	6					7	3			19
186	23	95	4	438	152	214	114	21	132	103	29	6	1	56	60	18	74	89
6	4	1		10	9	6	3	8	4	1				2	6	7	3	7
12	2	2	3	13	23	5	3	5	3		1			13	4	1		1
23	7	9		34	23	31	5	61	16	3				9	24	4		19
9	8	3	11	14	17	13	3	7	8	3				4	14	22		
32	2	13	4	24	28	19	9	22	7	2				9	15	12	2	17
13	2	7	4	16	22	9	2	8	5		2					2	4	13
13	2	9	1	8	16	9	1	10	4	2				2	10	2	3	3
9	1	6	6	13	12	6	2	6	3					4	4	5	3	
1	17		2	105	10	14	3	1	7		2	1		1	1	8	1	6
9	2	4	5	10	9	5	1	7	7					2		2	4	5
38	10	18	1	51	65	41	8	39	30	1	3	2	3	29	14	29	5	37
38		5	10	24	17	28	11	20	8	4	3	3		9	6	14	6	10
13	5	3		25	14	2		16	8	1		1	1	2	3	13		18
37	5	11	3	24	29	26	6	53	30	5		1	2	4	16	23	3	13
23	2	9		7	46	28	43	3	63	8	3		1	4	5	57	2	44
25	2	15	3	37	25	19		20	13	2			1		15	17	7	10
19	7	7	1	14	26	18	8	35	17	3	1				9	21	29	17
16	2		4	13	17	19	5	24	3	1	5				6	7	1	12
19	1	11		36	17	8	4	22	9	2	1			2	6	8		17
12	1	5	6	12	14	18	1	6	23			1			5	9		15
10		9		11	14	5	2	13	3					2	13	5	2	6
8		2		4	6	3		11	3	1				4	1	3		6
33	5	12	8	22	32	24	4	13	11	6	4	1	14	8	15	9	28	
5	2	3	3	15	7	6	3	7	3	1	2			2	6	2	4	
10	2	1		12	16	9		12	8	2					9	7	12	
20	4	1	6	8	16	9	1	19	4				1	7	6	4		6
8	7			4	16	14	3	4	5	3					12	1	10	
29	5	1		22	30	13		22	12					19	9	8		
47	19	1	40	12	33	59	20	51	11	5				9	18	13	1	25
7	4	1	5	9	5	8	3	7	3				2		3	4		13
11	4	4	2	5	10	7	5	4	4						7			
24	15	2	9	51	27	12	3	27	19					16	29	24	3	20
3	6	1		12	4	5	1	14	2		1			7	5	6		5
81	5	23	1	60	66	60	9	79	55	2	2	11	1		31	44	31	69
11	7		3	19	18	5	2	21	11	1					4	5	5	6
188	28	93	14	216	167	159	87	287	132	21	6	3	8	63	114	181	56	222
14	6	2		7	9	5	1	14	7	2	1				5	9	7	6
8	1		1	13	5	11	3	12	2	1					3	8		
2	5			16	9	9	2	3	8	2	1				12	2		10
8	1	5	2	28	15	2	1	16	2	2					4	9		5



## ABSTRACT OF THE REPORTS OF DEATHS

Cities.	* Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.										
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.	Dysentery.	Purulent and Septicemic Infections.	
Wooster .....	6,144	†	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Xenia .....	10,000	†	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Youngstown .....	59,441	899	15.13	255	101	29	1	1	7	5	9	30	.....	3	7	
Zanesville .....	26,000	388	14.92	.....	.....	15	2	1	1	.....	.....	9	.....	.....	.....	
	2,152,167	30,578	14.21	4,888	2,317	758	17	1	210	114	120	529	130	118	25	

\* By health officers.

† No report received.

‡ 422 non-resident deaths not included.

## AND THEIR CAUSES DURING 1906 — Concluded.

General Diseases.					Diseases of Nervous System.	Diseases of Circulatory System.	Diseases of Respiratory System.		Diseases of Digestive System.	Diseases of Genito-Urinary System.	Feveral Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.
Pulmonary Tuberculosis.	Other Forms of Tuberculosis.	Cancer.	Rheumatism and Gout.	Other General Diseases.			Pneumonia.	Other Respiratory Diseases.											
61	8	26	1	21	114	84	19	139	43	4	3	1	5	56	44	88	25	88	
36	2	15	4	19	58	29	16	41	22	4	1	4	.....	27	25	12	21		
3,200	334	1,306	139	1,204	3,657	2,907	1,050	3,654	1,883	236	100	72	108	1,218	1,371	1,839	778	2,012	

## ABSTRACT OF THE REPORTS OF DEATHS

Villages.	*Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.								
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.	
Aberdeen	700	7	10.00	1										
Ada	3,300	31	9.39								1			
Adamsville	250	4	16.00	1										
Alexandria	420	2	4.76	1										
Alger	850	7	8.24	1	3							1		
Anna	600	6	10.00											
Apple Creek	500	5	10.00	1										
Arcanum	1,400	19	13.57	1	2									
Archbold	1,000	13	13.00	1		1								
Arlington	950	11	11.58	6	3					2	1			
Arnettsville	225	8	35.55											
Ashland	7,000	72	10.29	10	3	1	1				2			
Ashley	800	8	10.00											
Ashville	1,100	1	.91			1								
Athalia	300	1	3.33											
Athens	5,802	44	7.58				1							
Attica	1,000	12	12.00											
Avon	2,500	28	11.20											
Bainbridge	1,000	14	14.00		1							1		
Bairdstown	300	2	6.67											
Barberton	8,000	91	11.37	9	4	3				1		2		
Barnesville	4,500	62	13.78	6		5								
Batavia	1,029	17	16.52	1	2					1			2	
Batesville	300	2	6.67	1										
Beaver Dam	500	4	8.00											
Bedford	2,003	36	17.97			2								
Belle Center	1,300	8	6.15			1								
Belle Valley	700	7	10.00											
Bellville	1,000	14	14.00											
Belmont	500	8	16.00	1										
Belpre	1,300	11	8.46	1	1							1		
Bethel	1,100	13	11.82	1		1								
Bettsville	500	2	4.00											
Beverly	712	7	9.83											
Blanchester	2,000	20	10.00							1				
Bloomdale	700	12	17.14										1	
Bloomington	650	7	10.77	1									1	
Bloomville	850	14	16.47	2	2									
Bluffton	2,500	21	8.40	3	3						1			
Bolivar	700	7	10.00	1		1					1			
Botkins	800	3	3.75	1										
Bowerston	625	4	6.40								1			
Bowersville	450	7	15.56											
Bradford	1,800	32	17.78	1	2									
Bradner	1,200	15	12.50											
Bridgeport	4,600	38	8.26			2								
Brooklyn Heights	340	4	11.76							1				
Brookville	1,000	6	6.00	1										
Bryan	4,000	33	8.25	3	1									
Buchtel	1,000	6	6.00								1			
Burbank	400	4	10.00			1								
Byesville	2,800	10	3.57	1	2	1			2			1		
Cadiz	2,000	29	14.50	5										
Caldwell	2,000	10	5.00											
Caledonia	750	7	9.33											
Camden	1,000	7	7.00	1	1									
Canfield	1,600	16	10.00		1									
Cardington	1,600	12	7.50		1							1		
Carey	2,400	27	11.25											
Carrollton	2,400	16	6.67	1									1	
Carthage	3,000	31	10.33	3										
Casstown	300	6	20.00											
Cedarville	1,300	23	17.69	1	4	2							1	
Celina	4,000	62	15.50			3					3			

‡ 16 non-resident deaths not included.

## AND THEIR CAUSES DURING 1906 — Continued.

General Diseases.										Diseases of Respiratory System.	Diseases of Digestive System.	Diseases of Genito-Urinary System.	Puerperal Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.
Dysentery.	Purulent and Septicemic Infections.	Pulmonary Tuberculosis.	Other Forms of Tuberculosis.	Cancer.	Rheumatism and Gout.	Other General Diseases.	Diseases of Nervous System.	Diseases of Circulatory System.	Pneumonia.												
1	1	2	1	3			1	1	4	1	4	1				1	1	1	1		2
		3					5	1	1		1										
			3				3	1	1												
		3					2	1	1												
	2			8	1		2	1	1	1	1	1									
		2		2			2	1			4										
	2	2		2			1	1													
	1	2	1	4			1	1	2		6	4				1					
	3			1			2	13	7		1	1				2		7	1	4	
		1					5	9	7		7	1									
	1	1		1		1	2	5	3		1	2	2				3	4	2	1	
		3		2		2	1	1			2	1	1				1			1	
	1	7		3			18	6	11	4	17	3					1	6	1	6	
	13			5			2	9	5		3	1			1			4			
	3						3	2													
		2																			
		2		1		3	6	4	5	3	1	2	2			1	3	2	2		3
		1					4	2			4	1				1	1	2		1	
		2		1			3	3	1		1	1	1					1	2		
	1			1			2	1	2	1	1	3					2	1	1		
		3				1	1				5						1	3			
							1	2			2	1						2		1	
				2		8	1	1			5						1	4	2		
		5		1			3	1			2							4	2	1	
				1			1	1			2						1	1			
	1	1					2	1	1		5	1	1	1	1		1	2	3		
							5	1	2		1	1	1	1	1		1	4	1		
							1				1							1			
	1						2		1	1	1	1			1			2			
		5	2	2			2	1	1	1	8	3	2					2	5		
							2	2			6	7	3	1				2	2	1	
	1	3					7	4	6		7	3					2	2			
		1					1		1	1	1	1	2				1	4	1	5	
		2		4			2	2			2			2			1				1
							1					2									
	1	1					7	3	4	1	7	3						2	1	2	5
							2				1		1				1	1			
								1			1	1									
		2					1	1	1		1	1					1	1			
							1	4	3	5	3										
		1					3	1			1						1	2	1		
1	1					2	3	2			2							1	2	1	2
		2					3	4	1	1	1	4	3		1			1	4	2	3
		1					1				1							1	1		4
		4					2	4	3		4						1	2			
1	1	7			2	1	9	5	1		8	5	1	1		8	4		2		











Villages.	*Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Group.	Grippe
Lore City .....	600	5	8.33	.	2	.	.	.	.	.	1	.	.
Londonville .....	1,900	27	14.21	1	4	1	.	.	.	4	.	.	.
Loveland .....	2,000	18	9.00	1	1	.	.	.	.	.	.	.	.
Lowell .....	500	8	16.00	.	.	.	.	.	.	.	.	.	.
Lowellville .....	2,000	29	14.50	13	2	.	.	.	.	.	.	.	.
Lower Salem .....	200	1	5.00	.	.	.	.	.	.	.	.	.	.
Lucas .....	350	3	8.61	.	.	.	.	.	.	.	.	.	.
Lynchburg .....	950	17	(7.9)	2	.	.	.	.	.	.	.	.	.
McArthur .....	1,200	12	10.00	.	1	.	.	.	.	.	.	1	.
McComb .....	1,680	10	5.95	.	.	.	.	.	.	.	.	.	.
McConnellsville .....	2,000	17	8.50	1	.	1	.	.	.	.	.	.	.
Macksburg .....	550	2	3.64	.	.	.	.	.	.	.	.	.	.
Madison .....	1,000	5	5.00	.	.	.	.	.	.	.	.	.	.
Magnolia .....	800	6	7.50	1	4	.	.	.	.	.	.	.	.
Maineville .....	300	2	6.67	.	.	.	.	.	.	.	.	.	.
Malvern .....	1,000	6	6.00	1	.	.	.	.	.	.	.	1	.
Manchester .....	2,000	22	11.00	.	2	1	.	.	.	.	.	.	.
Marengo .....	275	2	7.27	.	.	.	.	.	.	.	.	.	.
Marseilles .....	400	7	17.50	.	2	.	.	.	.	.	.	.	.
Marshallville .....	400	1	2.50	.	.	.	.	.	.	.	.	.	.
Martinsburg .....	250	3	12.00	1	.	.	.	.	.	.	.	.	.
Martinsville .....	400	4	10.00	.	.	.	.	.	.	.	.	.	.
Marysville .....	4,500	25	5.56	2	.	1	.	.	.	.	1	.	.
Maumee .....	2,500	41	16.40	.	.	1	.	.	.	.	.	.	.
Mechanicsburg .....	1,800	26	14.44	.	.	2	.	.	.	.	.	.	.
Medina .....	2,500	42	16.80	3	.	2	.	.	.	.	.	.	.
Melrose .....	450	5	11.11	.	.	.	.	.	.	.	.	.	.
Mendon .....	800	12	15.00	5	1	1	.	.	.	.	3	1	.
Mentor .....	700	8	11.43	1	.	1	.	.	.	.	.	.	.
Middleport .....	3,500	43	12.29	3	3	2	.	.	.	.	.	.	.
Mifflin .....	250	2	8.00	.	.	.	.	.	.	.	.	.	.
Milford .....	1,400	18	12.86	3	1	1	.	.	.	.	.	.	.
Millbury .....	350	2	5.71	.	.	.	.	.	.	.	.	.	.
Miller City .....	250	4	16.00	.	1	1	.	.	.	.	.	.	.
Mineral Ridge .....	1,200	13	10.83	.	.	1	.	.	.	.	.	.	.
Minerva .....	1,600	14	8.75	.	.	.	.	.	.	.	.	3	.
Minster .....	1,500	23	18.67	1	2	5	.	.	.	.	.	.	.
Mogadore .....	500	2	4.00	1	.	.	.	.	.	.	.	.	.
Montezuma .....	200	1	5.00	1	.	.	.	.	.	.	.	.	.
Morristown .....	352	6	17.05	.	.	.	.	.	.	.	.	.	.
Mt. Blanchard .....	500	7	14.00	.	.	1	.	.	.	.	.	.	.
Mt. Gilead .....	2,000	24	12.00	.	.	.	.	.	.	.	.	3	.
Mt. Healthy .....	1,800	19	10.56	.	.	.	.	.	.	.	.	.	.
Mt. Orab .....	700	7	10.00	.	.	.	.	.	.	.	.	2	.
Mt. Sterling .....	1,000	15	15.00	1	.	.	.	.	.	.	.	.	.
Mt. Washington .....	800	8	10.00	.	.	.	.	.	.	.	.	.	.
Murray City .....	1,300	15	11.54	3	4	.	.	.	.	2	.	4	.
Napoleon .....	3,686	50	16.23	2	3	4	.	.	.	.	.	2	.
Nashville .....	766	2											





## ABSTRACT OF THE REPORTS OF DEATHS

Villages.	*Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
New Richmond	2,200	38	17.27		1	3	1					1	4
New Straitsville	3,600	27	9.00										
Newtown	700	12	17.14	1									
New Vienna	800	12	15.00										
New Waterford	500	5	10.00	1									
New Weston	318	5	15.72		1								
Ney	450	2	4.44										
North Amherst	2,000	13	6.50			2							
North Baltimore	3,500	31	8.86	2	1	2						1	
North Bend	700	10	14.29	2									
North Lewisburg	900	22	24.44	2	3			1				1	
North Robinson	200	2	10.00										
Nottingham	1,500	16	10.67	2						1			
Oak Harbor	1,631	8	4.90			1							
Oak Hill	1,100	20	18.18			2							
Oakley	1,000	12	12.00			1		2				1	
Oakwood	500	6	12.00		1								
Oberlin	5,000	55	11.00	1								1	
Orrville	2,500	30	12.00	4		1							
Osborn	998	15	15.03										
Osgood	225	2	8.88		2								
Osnaburg	700	5	7.14			2							
Ostrander	500	8	16.00										
Ottawa	2,300	9	3.91	1									
Oxford	2,500	16	6.40	1	2								
Palestine	250	3	12.00										
Payne	1,356	10	7.37		1								
Peninsula	650	11	16.92	1									
Peebles	900	29	32.22	1	6	9					5		4
Perrysburg	2,000	23	11.50	1	1							1	
Pickerington	350	2	5.71		1								
Pioneer	800	13	16.25				1						
Plain City	1,800	16	8.89	1									1
Plainfield	200	4	20.00										
Pleasant City	1,200	9	7.50									1	
Pleasant Hill	700	10	14.29	2		1							
Pleasant Ridge	1,200	26	21.67	4		1				1			
Pleasantville	650	11	16.92	3									
Plymouth	1,170	19	16.24	1		1							
Pomeroy	4,800	30	6.25	3	1							2	
Portage	750	1	1.33										
Port Clinton	3,000	37	12.33	7	2								1
Port Jefferson	400	5	12.50			1							
Port Washington	500	4	8.00		1							2	
Prairie Depot	315	3	3.68					1	1				
Proctorville	550	7	12.73		1								
Prospect	1,200	6	5.00										
Put-in-Bay	300	2	6.67										
Quaker City	900	3	3.33		2								
Quincy	900	3	3.33										
Racine	500	3	6.00		1								
Ravenna	5,000	61	12.20	5	1	2							
Rawson	512	3	5.86	2									
Reading	4,000	31	7.75	3	6							2	
Reynoldsburg	400	2	5.00										
Richmond	300	4	13.33										
Ripley	2,500	44	17.60	1	3	4		2					
Rising Sun	800	2	2.50	1									
Rochester	250	5	20.00										
Rock Creek	500	15	30.00	2									1
Rockport	2,500	13	5.20	2	1							1	
Rocky Ridge	450	5	11.11										
Rocky River	2,000	8	4.00	1	1	1							
Roseville	1,500	11	7.33									1	
Rossville	315	1	3.14										



## ABSTRACT OF THE REPORTS OF DEATHS

Villages.	*Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
Rushville .....	350	4	11.43										
Rushsylvania .....	800	11	13.75										1
Sabina .....	1,600	11	6.87										
St. Bernard .....	4,000	63	15.75	14	13	1							
St. Clairsville .....	1,300	10	7.69	1									
St. Paris .....	1,400	21	15.00	1	3								
Salineville .....	3,000	23	7.67			1							1
Sarahsville .....	200	1	5.00										
Scio .....	1,350	5	3.70									1	
Sebring .....	2,500	14	5.60										
Seven Mile .....	400	5	12.50										
Shawnee .....	3,500	16	4.57	1	2	3							
Shelby .....	6,000	83	13.83	19		2		1		3	3		
Shiloh .....	650	6	7.69	1									
Shreve .....	1,100	9	8.18	3									
Silverton .....	350	2	5.71										
Sinking Spring .....	250	6	24.00			1							
Smithville .....	500	8	16.00	1									
Somerset .....	1,300	9	6.92		1							1	1
Somerville .....	350	6	17.14										
South Charleston .....	1,000	12	10.95										
South Lebanon .....	700	5	7.14	2	1								
South Point .....	300	2	6.67		1			1					
South Webster .....	700	3	4.29										
Spencerville .....	2,600	2	.77										
Springboro .....	500	4	8.00										
Spring Valley .....	600	4	6.67			3							
Stockport .....	400	8	20.00			1							1
Strasburg .....	1,000	8	8.00			1							
Struthers .....	2,500	33	11.71	13	14	1			1				1
Stryker .....	1,250	3	2.40										
Sugar Creek .....	400	1	2.50	1									
Sugar Grove .....	400	4	10.00										
Sylvania .....	1,100	4	3.64			1							
Taylorville .....	700	5	7.14	1									
Thornville .....	450	8	17.78	1									
Tippecanoe City .....	2,100	28	13.33		1								
Tontogany .....	300	4	13.33	1									
Toronto .....	6,000	48	8.00			5				3	4		
Trenton .....	600	6	10.00										
Trimble .....	600	13	21.67		3	4			2		1		
Trotwood .....	400	7	17.50	1	1								
Uhrichsville .....	5,000	57	11.40	3	6	2			1	1	2		
Union City .....	2,500	10	4.00	3	3						1		
Unionville Center .....	425	3	7.06										
Unionopolis .....	500	3	6.00										
Upper Sandusky .....	4,000	32	8.00			4						1	
Utica .....	3,000	13	4.33										
Vandalia .....	300	7	23.33									1	
Versailles .....	1,500	16	10.67	1						1			
Vienna Cross Roads .....	350	4	11.41										
Wadsworth .....	2,500	34	13.60			1							
Wapakoneta .....	5,500	47	8.55	7	3	2						1	
Washington .....	400	11	27.50	2	1								
Washingtonville .....	900	12	13.33	2		1							
Waverly .....	1,900	25	13.16	2	1	1							
Waynesfield .....	800	4	5.00										
Waynesville .....	800	14	17.50		1								
Wellington .....	2,000	29	14.50	4	2								
West Alexandria .....	1,200	10	8.33		2								
Western Star .....	248	4	16.13			3							
Westerville .....	1,800	13	10.00										
West Farmington .....	700	17	24.29		3					1			
West Jefferson .....	850	8	9.41		1		1						
West Liberty .....	1,350	20	14.81	2	1								

AND THEIR CAUSES DURING 1906—Continued.

[illegible]

## ABSTRACT OF THE REPORTS OF DEATHS.

Villages.	* Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.						
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Group.
West Manchester .....	400	3	7.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
West Mansfield .....	1,000	11	11.00	.....	.....	2	1	.....	.....	.....	.....	.....
West Milton .....	1,200	14	11.67	1	.....	.....	.....	.....	.....	.....	.....	.....
West Rushville .....	150	3	20.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
West Salem .....	700	12	17.14	.....	.....	.....	.....	.....	.....	.....	.....	.....
West Union .....	1,400	15	10.71	.....	1	1	.....	.....	.....	.....	.....	.....
West Unity .....	980	9	9.18	.....	.....	.....	.....	.....	.....	.....	.....	.....
Whitehouse .....	620	12	19.35	2	1	.....	.....	.....	.....	.....	.....	.....
Winchester .....	1,000	12	12.00	.....	.....	1	.....	.....	.....	.....	.....	.....
Windham .....	350	2	5.71	.....	.....	.....	.....	.....	.....	.....	.....	.....
Williamsburg .....	1,350	20	14.81	1	3	1	1	.....	.....	.....	1	.....
Williamsport .....	600	7	11.67	.....	1	.....	.....	.....	.....	.....	.....	.....
Willshire .....	550	7	12.73	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wilmington .....	4,000	12	3.00	.....	4	1	1	.....	.....	.....	.....	.....
Woodfield .....	3,000	30	10.00	.....	.....	2	.....	.....	.....	.....	.....	.....
Woodstock .....	400	4	10.00	.....	.....	1	.....	.....	.....	.....	.....	.....
Woodville .....	1,000	13	13.00	1	1	.....	.....	.....	.....	.....	.....	.....
Worthington .....	500	8	16.00	1	.....	2	.....	.....	.....	.....	.....	.....
Wren .....	275	2	7.21	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wyoming .....	1,800	17	9.44	2	.....	.....	.....	.....	.....	.....	.....	.....
Yellow Spring .....	1,500	23	15.33	3	.....	1	1	.....	.....	.....	.....	.....
Yorkshire .....	150	3	20.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Zoar .....	175	1	5.66	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total .....	575,356	5,951	10.34	410	299	195	9	1	15	25	40	92
												40

\* By health officers.





## ABSTRACT OF THE REPORTS OF DEATHS

Townships.	Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
Adams—													
Franklin .....	1,572	4	2.54			1						2	
Manchester .....	67	2	29.85										
Meigs .....	2,350	20	8.51			3							
Oliver .....	976	14	14.34	4	4	1							
Winchester .....	936	10	10.68			1							1
Allen—													
Amanda .....	1,384	3	2.17			1							1
Bath .....	1,517	13	8.57										
Marion .....	2,284	5	2.19			2				1		2	
Monroe .....	1,537	4	2.60										
Perry .....	1,467	2	1.36		1								
Richland .....	1,839	6	3.26										
Shawnee .....	1,493	11	7.48										
Ashland—													
Green .....	1,206	11	9.12	1									
Jackson .....	923	10	10.83										
Lake .....	684	5	7.31										
Milton .....	869	10	11.41										
Mohican .....	1,123	11	9.80	1									
Orange .....	1,211	7	5.83										
Ruggles .....	630	13	20.63										1
Sullivan .....	808	7	8.70	1									1
Vermillion .....	1,230	9	7.32										1
Ashtabula—													
Andover .....	719	11	15.30		2								
Ashtabula .....	1,038	17	16.38	2									
Colebrook .....	773	5	6.46										
Conneaut .....	2,392	2	.84										
Denmark .....	703	5	7.11										
Dorset .....	878	3	3.42		1	3							
Geneva .....	1,254	16	12.76			3				3			
Harpersfield .....	893	15	16.80			2							
Kingsville .....	1,412	21	14.87										
Lenox .....	742	9	12.13										
Morgan .....	562	4	7.12										
New Lyme .....	837	14	16.75										
Plymouth .....	723	7	9.68	1							1		
Richmond .....	848	7	8.25			1							
Trumbull .....	855	12	14.06	1									
Wayne .....	685	14	20.44										
Williamsfield .....	900	14	15.56		3								
Athens—													
Alexander .....	1,173	12	10.24	1		3					2		
Bern .....	1,600	1	.60		1					1			
Carthage .....	1,136	6	5.28	1		1							
Dover .....	1,488	19	12.77	2	3							3	
Rome .....	1,767	4	2.26										
Troy .....	1,426	15	10.52		4	1			1				
Waterloo .....	2,508	38	15.15	4	4	1						1	
York .....	3,762	30	7.97	7	5					1			
Auglaize—													
Duchouquet .....	1,636	9	5.50		1	1					1		1
German .....	893	11	12.32	2									
Goshen .....	908	4	4.41										
Jackson .....	731	3	4.10										
Noble .....	1,360	4	2.94	1									
Pusheta .....	1,275	8	6.27							1			
Salem .....	959	4	4.16	2									
Union .....	1,666	12	7.20										
Belmont—													
Colerain .....	2,987	2	.67		1							2	
Flushing .....	1,488	16	10.75	1	4								
Goshen .....	2,049	25	12.20	3	1					2			
Kirkwood .....	1,662	12	7.22		2								

AND THEIR CAUSES DURING 1906—Continued.

Dysentery.	General Diseases.					Diseases of Nervous System.	Diseases of Circulatory System.	Diseases of Respiratory System.		Diseases of Digestive System.	Diseases of Genito-Urinary System.	Feveral Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still-Births.
	Purulent and Septicemic Infections.	Pulmonary Tuberculosis.	Other Forms of Tuberculosis.	Cancer.	Rheumatism and Gout.			Pneumonia.	Other Respiratory Diseases.											
1	2	3				3	3	2										1		
		1			1	1	1	1		3	1					2	4		1	
3		3					2	1	2						1	1				
1		1						1										1		1
		2				1					1					1	2		4	
1		1		1		1	1	1		2	1					1	2	2		
					1	3	3	2	1		1					3		2		
		1			2	3	2			2	1					1	2	3		
		1			1					3	2					2	2	1		
					1		2	1												
					1		3	1		2	1	2						1	1	
1		1			1		3	4	1	4	1					1	2	1	1	
						1	1	1								1		1		
						1	1	2												
		2				1	3	1		1	1					1	3			
1		1				2	2	1		1	2					2	3			
						1	1	3		3						1				
		1				1	1	2								1	2	1		
						1	3	2		3						1	3	3		
						1	2	2								2	3	3		
							2	1	1							1				
1		1					1	1										1		
		1					2	2		4	1						1	4		
		1				1	4	8		2	4					1	2	1		
		4				4	6	3		1	2	2				6	4	4		2
																			5	
	1						2	1	4	2							1			1
							1	1		1										
							1	1		1						2		4		
							3	1		4						1				
							2	5		7	1									3
1		2				2	1	3		3	2						9			2







## ABSTRACT OF THE REPORTS OF DEATHS

Townships.	Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.								
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.	
West .....	1,757	24	13.66											
Yellow Creek .....	616	4	6.49											1
Coshocton—														
Adams .....	968	3	3.10											
Bethlehem .....	730	6	8.22											
Franklin .....	1,137	8	7.05	1	1	1				1			1	
Jackson .....	1,696	6	3.54											
Linton .....	1,216	14	11.51							1				
Monroe .....	909	11	12.10	1										
New Castle .....	924	4	4.33		1									
Oxford .....	1,031	7	6.79											
Tiverton .....	876	10	11.42										1	1
Tuscarawas .....	1,866	11	5.89		2	3						1	2	
Washington .....	748	3	4.01			1								
White Eyes .....	1,033	15	14.52			1								1
Crawford—														
Holmes .....	1,500	9	6.00	1	1	2								
Jefferson .....	697	10	14.35											
Liberty .....	1,566	8	5.11											
Lykens .....	930	4	4.30	1										
Texas .....	516	4	7.75	1		1								
Tod .....	882	8	9.07											
Cuyahoga—														
Bedford .....	1,140	5	4.39		1	2								1
Brecksville .....	1,053	7	6.65											
Chagrin Falls .....	414	3	7.25											
Dover .....	2,233	28	12.54	2	2						1			
Evelid .....	2,634	24	9.87		5									
Middleburgh .....	2,525	18	7.13			1								
Olmsted .....	1,614	6	3.72											
Orange .....	801	2	2.50											
Royalton .....	1,128	13	11.52	1										
Solon .....	903	7	7.75											
Strongsville .....	1,178	10	8.49											
Warrensville .....	1,634	38	23.26	1		1	1							
Darke—														
Allen .....	1,650	1	61											
Butler .....	1,659	11	6.63											
Franklin .....	1,635	8	4.89		1	1								
German .....	1,376	9	6.54			1				1				
Greenville .....	2,940	31	10.54	3	1	2								
Harrison .....	1,212	7	5.88			2								
Jackson .....	1,516	5	3.30		1	1								
Patterson .....	1,475	14	9.49	2										
Richland .....	1,217	2	1.64											
Twin .....	1,448	21	14.50											
Wabash .....	1,334	5	3.75	1										
Wayne .....	1,371	9	6.56	2	2		3							
York .....	942	4	4.25											
Defiance—														
Farmer .....	1,325	9	6.79			1								
Mark .....	1,685	5	2.97											
Noble .....	810	3	3.70		1									
Richland .....	1,444	1	.69											1
Tiffin .....	1,514	5	3.30	1										
Washington .....	1,265	2	1.58											
Delaware—														
Genoa .....	922	1	1.08											
Harlem .....	1,005	9	8.95		1									
Kingston .....	629	3	4.77											
Orange .....	976	11	11.27	3										
Porter .....	738	3	4.07	1										
Radnor .....	1,133	3	2.65		1									
Scioto .....	1,194	16	13.40											

## AND THEIR CAUSES DURING 1906—Continued.

Dysentery.	Purulent and Septicemic Infections.	Pulmonary Tuberculosis.	General Diseases.			Other General Diseases.	Diseases of Nervous System.	Diseases of Circulatory System.	Pneumonia.	Diseases of Respiratory System.	Other Respiratory Diseases.	Diseases of Digestive System.	Diseases of Genito-Urinary System.	Puerperal Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.
			Other Forms of Tuberculosis.	Cancer.	Rheumatism and Gout.																	
			2	2			4	5				2	1					1	1	1	7	
						1	2	1				1	1					2	1			
							1	1				1	1					1	1			
1		1		1		1	1	1	1	1	1	1	1					1	2		2	
			1	1		1		3		2	2	1	1					1	1			
1						2		1				1	1					1	1	1		
	1	1								2	2	1	2					1	1	2		
2							1	1				2						4	1	2		
		1	4	1			2	3	1										1		2	
							1	1		1	1	1	2						1			
				1			1					1	1					2			3	
			1				2	1	1	1	1							1				
			3	2		7	5	2	3	2	2	1	1					3	2	1		
		2					2	1	2	1	4	5		2				5	1	2	7	
							1	3										1	2		1	
		1					1	1				1	1					2	2	2		1
		23	1	1			1	2	1	2	1	1	1					3	2	7		
		2		1		5	1					1						1				
		1	1				2		1			1										
		6	1			7	2	3	2			2	2					1	1	2	1	2
	1					3	1		1			1						1				
			2	1			1					2										
		5	2	1			3	2	1			4	1					2			1	
			1	1				2		2		1						1	1			
		1					1	1											1	1		
1						3	1					1	1	1		1						
						2							1					1			1	
				1								1	1						1			
							1	2										1	1			
		1	2				1					1	1						1			
				1								1									1	
2			1							2		1	1						1		1	
		1					1	1													1	
3		5	1		3		1	3										1		1	1	1

## ABSTRACT OF THE REPORTS OF DEATHS

Townships.	Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
Thompson .....	709	2	2.82			1							
Trenton .....	869	3	3.45		2					1		2	
Troy .....	729	1	1.37							1			
Eric—													
Oxford .....	950	3	3.16										
Fairfield—													
Bloom .....	1,500	25	16.67			2						1	
Clear Creek .....	1,810	29	16.02			1							
Greenfield .....	1,563	15	9.60	3								1	
Hocking .....	2,313	23	9.94	1	2	1						1	
Liberty .....	2,352	1	.43									1	
Richland .....	956	7	7.32		3								
Rush Creek .....	1,390	16	11.51										
Fayette—													
Concord .....	733	2	2.73										
Green .....	701	2	2.55										
Jasper .....	1,446	14	9.68	2	1								
Jefferson .....	2,339	1	.45			1							
Madison .....	1,317	1	.76										
Franklin—													
Clinton .....	4,385	3	.68			2						1	
Hamilton .....	1,474	6	4.07			1							
Jackson .....	1,633	13	7.96		2								
Plain .....	939	17	18.10										1
Sharon .....	1,356	10	7.37	1									
Truro .....	1,525	1	.66									1	
Washington .....	964	9	9.34		1	2							
Fulton—													
Franklin .....	1,133	3	2.64										
Royalton .....	1,193	6	5.01										
Gallia—													
Cheshire .....	1,851	4	2.16	1								1	
Green .....	1,257	8	6.36										
Greenfield .....	1,253	10	7.98	1	2	1							
Morgan .....	1,232	6	4.87	1									
Raccoon .....	1,273	5	3.93		3							1	
Springfield .....	1,844	11	5.97	1	2							1	
Walnut .....	1,687	19	11.26		2	3						2	
Geauga—													
Bainbridge .....	753	4	5.28										
Chester .....	716	4	5.59										
Claridon .....	764	11	14.27	2						1			
Hampden .....	603	6	9.95										
Huntsburg .....	809	4	4.94										
Munson .....	780	3	3.83										
Newbury .....	955	1	1.05							1			
Parkman .....	849	9	10.60										
Russell .....	695	7	10.07			2							
Thompson .....	909	7	7.70									1	
Troy .....	897	8	8.92		1								
Greene—													
Caesar Creek .....	1,039	12	11.55										
Cedarville .....	1,278	17	13.30		1	2							
Jefferson .....	1,158	11	9.33	1		1							
Ross .....	1,141	8	7.00										
Silver Creek .....	1,109	9	8.12										
Spring Valley .....	938	3	3.20	1									1
Guernsey—													
Adams .....	717	4	5.53										
Cambridge .....	1,650	5	3.03							2		2	
Center .....	1,821	28	15.38	2	5	1		1	2	1		3	
Jackson .....	1,898	60	31.61			2		3	2	1		4	2
Knox .....	845	5	5.92	1	1								
Liberty .....	1,054	9	8.54		1					1			



## ABSTRACT OF THE REPORTS OF DEATHS.

Townships.	Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
Oxford	1,061	7	6.60		6					6			
Westland	711	8	11.25										
Mills	1,045	1	.96										
Hamilton—													
Anderson	3,753	36	9.59	5	1								
Colerain	3,410	25	7.33	4									
Columbia	2,398	14	5.84	4					1				
Crosby	883	12	13.60	2	2				1			1	
Delhi	3,479	10	2.87		2	2				1		2	
Green	4,532	30	6.62			1				1			
Harrison	636	6	9.43			1							
Millcreek	5,304	26	4.90		2	1			1				
Spencer	257	5	19.45	2		1							
Springfield	3,929	13	3.31										
Sycamore	3,887	32	8.23										
Symmes	1,109	8	7.21			1	1						
Whitewater	1,291	15	11.62		2					1			
Hancock—													
Big Lick	1,156	4	3.46										
Blanchard	933	5	5.36	2									
Liberty	1,486	3	2.02		1								
Madison	1,009	11	10.90		1	1				1			
Marion	1,079	2	1.85										
Pleasant	1,503	11	7.32	4									
Van Buren	789	8	10.14	2							1		
Hardin—													
Blanchard	804	23	28.61										
Cessna	804	1	1.24		1					1			
Jackson	822	3	3.65		1							1	
Liberty	1,410	15	10.64										
Marion	1,098	9	8.20									2	
Pleasant	1,418	1	.71			1							
Harrison—													
Archer	700	3	4.29										
Franklin	677	14	20.69										
German	1,203	22	18.29										
Monroe	955	15	15.71	1		1							
Moorefield	1,222	13	10.64										
North	1,034	4	3.87										
Stock	501	2	3.39										
Washington	1,247	12	9.62										1
Henry—													
Flat Rock	1,359	28	20.60	3	1	1					1		2
Harrison	1,232	5	4.06										
Marion	1,568	4	2.55		1								
Richfield	1,708	3	1.76										
Ridgeville	1,241	16	12.90	4	1	1							
Washington	1,488	14	11.78										
Highland—													
Concord	1,097	11	10.03	1	4								
Dodson	1,068	2	1.87										
Hammer	918	8	8.71		1				1				
Jackson	912	10	10.96			2							
Marshall	740	5	6.76		1								
Paint	2,226	6	2.69	1									
Salem	869	6	6.90	1							1		
White Oak	1,228	8	6.51							8			
Hocking—													
Falls	1,735	5	2.88		1					1		4	
Good Hope	1,277	7	5.48			1							
Green	1,411	4	2.83	1	3							4	
Marion	1,215	5	4.12		1								
Salt Creek	1,509	13	8.61	1	1	1							
Ward	6,022	26	4.32	2	8	2				2		2	



AND THEIR CAUSES DURING 1906 — Continued.

[illegible]



## AND THEIR CAUSES DURING 1906—Continued.

General Diseases.																							Diseases of Respiratory System.	Diseases of Digestive System.	Diseases of Genito-Urinary System.	Furcular Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.
Dysentery.	Purulent and Septicemic Infections.	Pulmonary Tuberculosis.	Other Forms of Tuberculosis.	Cancer.	Rheumatism and Gout.	Other General Diseases.	Diseases of Nervous System.	Diseases of Circulatory System.	Pneumonia.	Other Respiratory Diseases.	Diseases of Digestive System.	Diseases of Genito-Urinary System.	Furcular Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.													
1	1	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	1	1	2	1	1												
1	1	3	2	2	3	1	1	1	2	2	1	1	1	3	2	2	1	1	1	1	1	2												
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
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1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
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1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
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1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
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1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1												
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1																		

## ABSTRACT OF THE REPORTS OF DEATHS

Townships.	Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
Logan—													
McArthur .....	940	28	29.79			5	1						10
Miami .....	657	2	3.04								1		
Monroe .....	1,067	15	14.06		1								
Perry .....	1,047	13	12.51		1								
Pleasant .....	978	11	11.25										
Union .....	774	6	7.75		2						1		
Washington .....	1,204	4	3.32	1		1							
Lorain—													
Brighton .....	490	7	14.29	2	1								
Brownhelm .....	1,100	6	5.45										1
Eaton .....	958	6	6.26			1							
Grafton .....	848	3	3.54		1								
Penfield .....	618	8	12.94	1									
Pittsfield .....	782	14	17.90	1									
Russia .....	981	9	9.17										
Lucas—													
Adams .....	2,090	22	10.53	3	2							2	
Oregon .....	2,702	23	8.51	7		2							
Providence .....	1,270	9	7.09										
Richfield .....	1,136	5	4.40										
Spencer .....	769	1	1.30	1									
Springfield .....	953	5	5.25	2									
Sylvania .....	1,270	11	8.66										
Madison—													
Canaan .....	881	5	5.68										
Deer Creek .....	882	9	10.20										
Fairfield .....	1,481	18	12.15		2							2	
Union .....	1,168	1	.86										
Mahoning—													
Beaver .....	1,929	50	25.92									1	
Berlin .....	725	3	4.12										
Coitsville .....	1,815	6	3.31			1							
Ellsworth .....	663	6	9.05	1									
Goshen .....	1,406	19	13.51										
Green .....	1,489	11	7.38										
Jackson .....	903	4	4.43										
Milton .....	657	3	4.57					1					
Smith .....	2,136	6	2.81										
Springfield .....	2,137	10	4.68			1							
Youngstown .....	3,161	16	5.06	3	1	1					1	1	
Marion—													
Bowling Green .....	978	9	9.20	4		1							1
Green Camp .....	762	2	2.62										
Montgomery .....	926	12	12.96		3								
Pleasant .....	1,109	9	8.12										
Scott .....	549	3	5.46										
Tully .....	877	7	7.98										
Waldo .....	644	4	6.21										
Medina—													
Brunswick .....	950	21	22.11										
Chatham .....	904	10	11.06										
Guilford .....	1,177	6	5.09										
Hinckley .....	840	9	10.71		1								
Lafayette .....	1,157	5	4.33	1	1								
Medina .....	671	13	19.22										
Montville .....	743	9	12.11										
Spencer .....	963	5	5.19										
York .....	993	6	6.10									1	
Meigs—													
Chester .....	1,597	6	3.76			1							
Columbia .....	1,016	3	2.95	1									
Mercer—													
Butler .....	1,368	19	13.90	3	3	2						6	
Franklin .....	1,003	5	4.99		1								





## ABSTRACT OF THE REPORTS OF DEATHS

Townships.	Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.						
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.
Hopewell .....	1,313	3	2.28									
Marion .....	2,368	19	8.03	2	4							1
Miami—												
Bethel .....	1,596	5	3.13			1						
Concord .....	1,306	5	3.83	2	1	1						
Monroe .....	1,228	7	5.70									
Newton .....	1,980	5	2.53	2								
Spring Creek .....	1,422	9	6.33		1							
Staunton .....	1,184	7	5.91			1						1
Union .....	2,803	16	5.69	3	1							
Washington .....	997	10	10.02			1						
Monroe—												
Adams .....	1,149	6	5.22									
Ohio .....	1,750	7	4.00									
Summit .....	695	7	10.01	2								
Switzerland .....	1,039	1	.96		1					1		
Montgomery—												
German .....	1,658	22	13.27	1		1						3
Harrison .....	3,837	7	1.82							1		3
Mad River .....	2,310	2	.86									
Randolph .....	2,075	11	5.30	1	1							
Morgan—												
Center .....	953	14	14.69			1						
Homer .....	1,426	5	3.50									2
Manchester .....	555	5	8.55	1								
Meigsville .....	1,078	9	8.35									
Union .....	1,272	2	1.58									
Windsor .....	1,745	23	13.18		5							
Morrow—												
Bennington .....	777	8	10.30		1							
Canaan .....	1,024	3	2.93									
Chester .....	661	1	1.51			1						
Congress .....	983	7	7.13	1								
Franklin .....	838	1	1.19									1
Harmony .....	711	8	11.25									
North Bloomfield .....	960	6	6.25									
Perry .....	935	12	12.83	1	1							
South Bloomfield .....	742	11	14.82			1						
Troy .....	641	6	9.36	1								
Westfield .....	948	2	2.11			1						1
Muskingum—												
Blue Rock .....	1,013	4	3.95									
Clay .....	285	4	14.03	1								
Falls .....	1,680	10	5.95		1							1
Highland .....	674	2	2.97									
Hopewell .....	1,372	22	16.03		5							
Jackson .....	816	3	3.68									
Licking .....	830	7	8.43			2						
Meigs .....	1,291	7	5.42	1								
Newton .....	1,883	1	.53									1
Salt Creek .....	1,024	8	7.81			2				1		
Springfield .....	1,504	3	1.99		1							1
Wayne .....	1,624	17	10.47									
Noble—												
Buffalo .....	1,033	6	5.81									
Elk .....	1,357	4	2.95									
Enoch .....	1,202	5	4.16									
Jackson .....	1,152	15	13.02		2							2
Olive .....	1,654	8	4.84							1		
Seneca .....	934	4	4.23	1	1							
Sharon .....	1,024	6	5.86							1		
Wayne .....	635	4	6.30	1								

## AND THEIR CAUSES DURING 1906 — Continued.

Dysentery.	General Diseases.						Diseases of Nervous System.	Diseases of Circulatory System.	Diseases of Respiratory System.		Diseases of Digestive System.	Diseases of Genito-Urinary System.	Furcular Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.
	Purulent and Septicemic Infections.	Pulmonary Tuberculosis.	Other Forms of Tuberculosis.	Cancer.	Rheumatism and Gout.	Other General Diseases.			Pneumonia.	Other Respiratory Diseases.											
..	..	..	..	1	..	..	1	1	1	1	..	..	2	..	..	..	4	2	1	1	1
..	..	1	..	1	..	..	1	1	1	1	..	..	..	..	..	..	1	..	..	..	..
2	1	1	..	1	..	..	1	2	1	1	1	..	..	..	..	..	..	..	..	..	..
..	1	..	1	2	..	..	1	1	..	..	1	..	..	..	..	..	..	..	1	..	..
..	1	..	1	..	..	..	2	3	..	1	1	1	..	..	1	..	..	1	..	..	..
..	2	1	..	1	..	..	2	3	1	1	2	..	..	..	..	..	1	..	1	..	..
..	..	2	..	..	..	..	1	2	1	..	1	..	..	..	..	..	..	..	..	..	..
..	..	..	3	..	5	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	1	1	..	2	2	..	..	..	..	2	1	..	..	..	..	3	..	..	..	..
..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	1	..	..	..	..	..	3	2	..	1	1	..	..	..	..	1	..	1	..	..
..	..	1	..	1	..	..	2	1	..	1	1	..	..	..	..	..	..	..	1	..	..
..	..	4	..	..	..	..	9	6	4	..	..	..	..	..	..	..	..	..	1	..	..
..	1	..	1	1	..	1	2	1	1	..	1	1	..	..	..	1	1	..	..	1	1
..	..	..	..	..	1	1	1	2	..	..	2	..	..	..	..	..	..	1	1	..	..
..	..	..	..	..	3	..	..	..	1	..	..	..	..	..	..	..	1	..	1	..	..
..	..	1	1	1	..	2	3	1	1	1	1	1	..	..	..	1	1	2	3	1	1
..	5	1	..	2	..	..	1	1	1	..	..	..	..	..	..	1	1	2	1	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	1	..	..	..	..	..	1	2	2	..	..	..	..	..	..	1	..	..	1	..	..
..	..	1	1	1	..	2	2	1	1	..	..	..	..	..	..	1	2	1	1	..	..
1	..	1	1	1	1	2	2	2	3	3	..	1	1	1	1	2	..	..	1	..	1
..	..	..	..	1	1	1	1	1	..	1	1	1	1	..	1	..	..	2	1	..	1
..	..	1	1	1	1	1	1	1	..	..	1	1	1	..	..	..	1	1	1	..	..
1	..	1	..	1	1	5	1	2	3	1	..	..	..	..	..	..	2	1	1	..	..
..	..	..	..	..	..	..	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	1	1	..	..	..	1	..	..	..	..	..	4	1	1	..	..
..	..	1	1	2	4	2	..	2	2	..	2	..	..	..	..	..	3	2	1	..	..
..	1	1	..	1	..	..	2	..	..	..	1	..	..	..	1	1	1	1	1	..	..
..	..	..	..	1	..	1	1	..	..	..	1	..	..	..	1	1	1	1	..	..	..

## ABSTRACT OF THE REPORTS OF DEATHS

Villages.	*Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
Ottawa—													
Allen .....	1,613	11	6.82	3	1	3					1		
Benton .....	2,341	21	8.97	1	1	1							
Carroll .....	1,734	8	4.61										
Catawba Island .....	606	11	18.15										
Harris .....	1,176	9	7.65										
Put-in-Bay .....	723	2	2.77										
Paulding—													
Blue Creek .....	1,967	12	6.10	1	1	1	1						
Carryall .....	1,312	1	.76										
Harrison .....	1,797	13	7.23	3	2	2							
Latty .....	1,901	17	8.94			3							
Perry—													
Bearfield .....	923	18	19.50	1					3			1	1
Coal .....	887	8	9.56		1							1	
Jackson .....	1,224	4	3.26	1									
Monday Creek .....	868	3	3.46	1		1							
Monroe .....	3,264	18	5.51										
Reading .....	1,843	15	8.14										
Salt Lick .....	1,367	13	9.51									5	
Thorn .....	1,421	16	11.18	2		8							1
Pickaway—													
Deer Creek .....	1,126	7	6.22	1	1								
Jackson .....	1,205	7	5.81										
Madison .....	794	5	6.30	1									
Monroe .....	1,410	12	8.51	2	1								
Pickaway .....	1,231	19	8.12	2	1								
Salt Creek .....	1,292	9	6.97	1	2	1							
Pike—													
Camp Creek .....	983	8	8.14										
Jackson .....	2,021	16	7.92		3	1	1		1			1	
Marion .....	786	1	1.27										
Pebble .....	1,288	5	3.88			2							
Sunfish .....	1,068	5	4.68		1		1						
Portage—													
Charlestown .....	688	4	5.81										
Deerfield .....	1,101	12	10.90	3									
Freedom .....	670	6	8.95	1									
Hiram .....	704	8	11.36	1									
Paris .....	598	3	5.28										
Shalersville .....	912	10	10.96		1		1						
Streetsboro .....	672	8	11.90	4									
Preble—													
Dixon .....	978	7	7.15										
Gratis .....	1,351	15	11.10		3	1							
Harrison .....	2,218	1	.45			1							
Israel .....	1,237	18	14.32										
Monroe .....	1,423	11	7.73		1								
Somers .....	918	9	9.80										
Washington .....	1,720	8	4.65	1									
Putnam—													
Jennings .....	1,465	13	8.87		1					1			
Monroe .....	1,671	13	7.78		3	1		1			1		
Perry .....	1,366	5	3.66		2								
Union .....	997	2	2.01	2									
Richland—													
Bloomington .....	978	4	4.09										
Butler .....	765	4	5.23										
Cass .....	720	18	25.00		1	3							
Jackson .....	841	4	4.76	1									
Jefferson .....	1,293	8	6.19										
Madison .....	2,581	8	3.10	1								1	
Monroe .....	1,224	8	6.54	1									
Plymouth .....	736	4	5.43										
Sandusky .....	598	4	6.69										
Worthington .....	1,258	7	5.56		1								



## ABSTRACT OF THE REPORTS OF DEATHS

Villages.	* Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
Ross—													
Concord .....	2,240	22	9.82										
Deerfield .....	905	6	6.63	1	1								
Green .....	1,276	8	6.27										
Huntington .....	2,269	1	.44										
Jefferson .....	936	3	3.21		1							1	
Liberty .....	1,559	16	10.00			3							
Paxton .....	950	1	1.02										
Scioto .....	1,973	2	1.01			1						1	
Springfield .....	1,133	12	10.60	3								3	
Twin .....	1,899	18	9.47	1	3	2							1
Union .....	2,317	3	1.29										
Sandusky—													
Ballville .....	1,778	10	5.62			1							
Green Creek .....	1,591	23	14.46			2							
Jackson .....	1,670	8	5.00	2	1	1							
Madison .....	1,492	5	3.35	1									
Sandusky .....	1,842	6	3.26	2	1					3			
Scott .....	1,720	5	2.91										
Townsend .....	1,567	11	7.02	2							1	1	
Woodville .....	1,188	6	5.05		2								
Scioto—													
Green .....	1,332	7	5.26			1							
Harris .....	1,269	1	.79									1	
Morgan .....	1,035	8	7.73	1									
Nile .....	1,892	12	6.44	1									
Porter .....	2,500	12	4.89		3							2	
Rarden .....	1,140	14	12.27			1							12
Vernon .....	918	8	8.71		1							1	
Washington .....	1,269	7	5.52			1							
Seneca—													
Big Spring .....	1,618	7	4.33										
Thompson .....	1,545	14	9.03		2								
Venice .....	1,299	10	7.75	1	2								1
Shelby—													
Clinton .....	1,149	23	20.02	3		1							
Cynthian .....	1,402	7	4.99										
Salem .....	1,072	4	3.73		1							3	
Van Buren .....	1,531	8	5.23			1							
Stark—													
Bethlehem .....	1,273	16	7.85									1	
Canton .....	3,341	12	3.59	3	1					1			
Jackson .....	2,090	6	2.87										
Lake .....	2,312	2	.87			2							
Lawrence .....	2,972	38	12.79	1		2						2	
Lexington .....	1,195	22	18.41	1	1		1						
Nimishillen .....	1,839	39	21.21								1		
Osnaburg .....	1,608	8	4.97			1							
Paris .....	1,727	17	9.84	2	1	1							
Perry .....	3,265	10	3.12	2	1								
Pike .....	1,491	23	15.42		2								
Plain .....	3,624	17	4.69			5							
Sandy .....	637	12	18.84	1									
Tuscarawas .....	1,139	41	9.90	3	3	1						1	
Washington .....	1,668	18	10.79									2	
Summit—													
Boston .....	689	6	8.71										
Copley .....	802	6	7.48										
Coventry .....	1,790	8	4.47	1	2							2	
Franklin .....	2,024	6	2.97										
Green .....	1,602	10	6.24	1	1	2							
Hudson .....	657	3	4.57		1								
Northampton .....	514	3	3.69										
Northfield .....	1,050	11	10.48		1								
Norton .....	1,674	11	6.57	1	1								





## ABSTRACT OF THE REPORTS OF DEATHS

Villages.	*Estimated Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
Richfield .....	930	7	7.53	1									
Tallmadge .....	1,363	13	9.54	2								1	
Twinsburg .....	805	10	12.42										
Trumbull—													
Bazetta .....	706	4	5.67										
Braceville .....	867	11	12.69		1								
Bristol .....	1,035	7	6.76										
Fowler .....	764	10	13.09		1				2				
Greene .....	841	10	22.58	2									
Gustavus .....	844	7	8.30			3							1
Hartford .....	1,195	8	6.70										1
Hubbard .....	1,441	19	13.18			1							
Johnston .....	753	8	10.62										1
Liberty .....	1,595	23	14.42	2	3	1			1	1		1	
Lordstown .....	722	5	6.93	1									1
Mecca .....	780	6	7.60										
Vienna .....	942	2	2.12										
Vernon .....	824	2	2.43										
Warren .....	1,060	12	11.32	1	1								
Tuscarawas—													
Auburn .....	984	3	3.05										
Bucks .....	1,223	5	4.09			1							
Franklin .....	962	9	9.36	1									
Goshen .....	2,266	1	.44									1	
Mill .....	1,549	5	3.23				1						
Oxford .....	851	3	3.53										
Union .....	825	8	9.70										
Warren .....	796	4	5.03			1							
Warwick .....	1,632	12	7.35	5	4								1
Washington .....	784	3	3.83										
York .....	1,027	5	4.87			2							
Union—													
Allen .....	957	8	8.36										
Clairbourne .....	1,401	9	6.42										
Dover .....	893	6	6.72										
Jackson .....	1,136	1	.88	1						1			
Jerome .....	1,307	3	2.70										
Leesburg .....	1,170	3	2.56										
Mill Creek .....	688	6	8.72		1								
Union .....	1,119	10	8.94										
Washington .....	1,186	5	4.22										
Van Wert—													
Harrison .....	1,145	17	11.76										
Hoaglin .....	1,608	6	3.73	3	2								
Jackson .....	1,238	4	3.23	1	2								
Jennings .....	1,338	5	3.74			2							1
Pleasant .....	1,326	8	5.99		1	1							
Tully .....	1,736	1	.58		1							1	
York .....	1,316	4	3.04										
Vinton—													
Brown .....	746	3	4.02										
Clinton .....	1,010	6	5.94										
Eagle .....	1,073	6	5.59	1									
Knox .....	933	5	5.25										
Madison .....	654	4	6.12			1							
Swan .....	979	3	3.66										
Vinton .....	1,336	10	7.48	1					1				
Warren—													
Clearcreek .....	1,987	18	9.06	3	1					1			
Deerfield .....	1,539	17	11.05										
Franklin .....	1,791	11	6.14	1			2						
Hamilton .....	1,693	5	2.95										
Harlan .....	1,650	9	5.45	2								1	
Union .....	555	4	7.21		2								



## ABSTRACT OF THE REPORTS OF DEATHS

Townships.	Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.							
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.
Washington .....	1,062	4	3.77			1							
Wayne .....	1,508	12	7.51										
Washington—													
Aurelius .....	806	4	4.96			1							
Belpre .....	2,761	26	9.42			2						1	
Decatur .....	1,276	6	4.70			3							
Fairfield .....	758	8	10.55		1				1				
Fearing .....	939	1	1.06	1									
Independence .....	1,632	8	4.90			1							
Lawrence .....	1,726	10	5.79		1	3							
Liberty .....	1,461	10	6.84		1	1							
Ludlow .....	1,237	4	3.23										
Marietta .....	2,416	51	21.11	4	2	10	5						10
Newport .....	2,564	16	6.24		2							2	
Warren .....	1,813	17	9.38			3				1			
Waterford .....	1,557	16	10.28			3							
Wesley .....	1,323	7	5.29			1							
Wayne—													
Baughman .....	1,529	4	2.62										
Chester .....	1,648	24	14.56	4							2		
Chippewa .....	1,818	12	6.60	3									
Clinton .....	985	6	6.09	3	1								
East Union .....	1,418	10	7.05	2	1	2							
Green .....	1,616	28	17.32	4	1	1							
Paint .....	1,044	14	13.41	1	4	2				1		1	
Salt Creek .....	1,045	10	9.57										
Williams—													
Brady .....	978	25	25.56	6	3								
Wood—													
Freedom .....	1,184	8	6.76								2		
Jackson .....	1,448	3	2.07			1	1						
Lake .....	1,703	8	4.69		2					2		1	
Liberty .....	2,870	7	2.44										
Milton .....	1,554	14	9.01	6	1					1			
Montgomery .....	1,637	18	11.00	2		1							
Perry .....	1,290	7	5.43									1	
Perrysburg .....	2,514	18	7.16		1	1							
Plain .....	1,120	8	7.14		5	2						3	
Ross .....	1,133	5	4.41			2							
Troy .....	1,940	4	2.06		2				2			2	
Washington .....	868	5	5.76										
Webster .....	1,303	6	4.60		1								
Weston .....	659	19	28.83	2	1								
Wyandot—													
Antrim .....	1,081	16	14.80										2
Crawford .....	970	12	12.37			3							
Eden .....	1,176	7	5.95										
Miffin .....	1,067	4	3.75						4				
Richland .....	1,036	3	2.90										
Ridge .....	504	2	3.97										
Salem .....	1,190	1	.84	1									
Total .....	879,866	6,301	7.16	352	334	285	18	3	33	64	26	153	81

## AND THEIR CAUSES DURING 1906 — Concluded.

	General Diseases.										Diseases of Respiratory System.	Diseases of Digestive System.	Diseases of Genito-Urinary System.	Puerperal Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.
	Dysentery.	Purulent and Septicemic Infections.	Pulmonary Tuberculosis.	Other Forms of Tuberculosis.	Cancer.	Rheumatism and Gout.	Other General Diseases.	Diseases of Nervous System.	Diseases of Circulatory System.	Pneumonia.	Other Respiratory Diseases.	Diseases of Digestive System.	Diseases of Genito-Urinary System.	Puerperal Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.
..	1	2	..	..	..	..	..	2	1	1	..	..	2	..	..	..	..	..	1	..	1	..
..	..	..	4	..	1	..	..	3	..	..	..	1	2	..	..	..	..	4	..	1	..	..
..	..	2	..	..	1	..	1	1	1	1	..	1	..	..	..	..	..	2	..	3	4	..
..	..	..	1	1	1	..	..	1	1	1	..	2	1	..	..	..	..	2	..	1	2	..
8	..	3	..	..	1	..	1	3	1	2	..	1	1	..	..	1	..	2	..	1	..	..
..	1	1	2	..	..	..	2	1	1	1	1	..	1	..	..	..	..	3	1	1	..	..
..	..	4	..	..	2	..	3	1	1	1	..	3	1	..	..	..	..	1	..	2	1	..
..	..	1	..	..	..	..	3	1	1	..	..	..	..	..	..	..	..	2	..	2	..	..
1	2	2	..	1	1	..	..	3	4	2	..	..	..	2	..	..	..	..	4	..	6	..
..	..	..	..	..	..	..	1	1	3	1	..	2	2	..	1	..	1	..	1	1	3	1
..	..	..	..	2	1	..	..	1	2	1	..	4	1	..	..	3	..	1	1	6	1	..
..	..	1	..	1	1	..	2	3	3	2	..	1	1	..	..	..	..	1	1	2	1	..
..	..	..	3	..	..	..	..	2	10	..	..	..	..	1	..	..	..	1	2	..	..	..
..	..	2	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	1	1	1	3
1	..	1	..	1	1	3	5	1	1	1	1	1	..	1	1	1	..	2	2	1	..	..
..	..	3	..	..	..	..	4	1	1	1	..	..	..	..	..	..	..	4	1	1	..	..
1	..	4	..	2	..	3	2	1	1	1	1	1	1	..	..	1	..	4	1	2	..	..
..	..	1	..	1	..	..	..	..	2	1	..	..	..	..	..	..	..	..	3	2	1	3
..	..	..	..	..	1	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..	..	..
..	..	1	..	2	..	1	..	2	5	1	1	1	4	..	..	..	..	1	1	..	2	..
..	..	1	..	..	..	..	..	2	2	2	2	..	..	1	1	..	..	1	2	..	..	..
..	..	..	1	1	..	..	3	1	1	1	1	1	..	..	..	..	..	1	1	..	2	2
..	..	..	1	..	..	..	1	..	2	..	..	..	1	..	..	..	..	..	..	..	..	..
98	36	539	150	265	42	246	591	607	373	109	465	269	73	13	36	18	182	690	352	390	158	..



## ABSTRACT OF THE REPORTS OF DEATHS

	Population.	Total Deaths.	Annual Rate Per 1,000.	Age.		General Diseases.											
				Under One.	One to Five.	Typhoid Fever.	Malarial Fever.	Smallpox.	Measles.	Scarlet Fever.	Whooping Cough.	Diphtheria and Croup.	Grippe.	Dysentery.	Purulent and Septicemic Infections.	Pulmonary Tuberculosis.	
Cities (58) .....	2,152,167	30,578	14.21	4,888	2,317	758	17	1	210	114	120	529	130	118	250	3,200	
Villages (412) .....	575,356	5,951	10.34	410	299	195	9	1	15	25	40	92	40	60	53	562	
Townships (670) .....	879,866	6,301	7.16	352	334	285	18	3	33	61	26	153	81	98	36	539	
Total .....	3,607,389	42,830	11.87	5,650	2,950	1,238	44	5	258	203	186	774	251	276	339	4,301	

## AND THEIR CAUSES DURING 1906.

General Diseases.				Diseases of Nervous System.	Diseases of Circulatory System.	Diseases of Respiratory System.		Diseases of Digestive System.	Diseases of Genito-Urinary System.	Puerperal Conditions.	Diseases of the Skin and Cellular Tissue.	Diseases of Organs of Locomotion.	Malformations.	Infantile Diseases.	Old Age.	External Violence.	Ill-defined Diseases.	Still Births.
Other Forms of Tuberculosis.	Cancer.	Rheumatism and Gout.	Other General Diseases.			Pneumonia.	Other Respiratory Diseases.											
334	11,306	139	1,204	3,657	2,891	2,907	1,050	3,654	1,883	236	100	72	108	1,218	1,371	1,839	778	2,012
115	274	34	170	722	665	404	127	524	322	77	14	33	11	105	375	302	235	178
150	265	42	246	591	607	373	109	465	269	73	13	36	18	182	690	352	390	153
599	1,845	215	1,620	4,970	4,163	3,684	1,286	4,643	2,474	386	127	141	137	1,505	2,436	2,493	1,403	2,348

## SUMMARY OF MORTALITY REPORTS.

The total number of deaths reported from all causes—excluding premature and still births—by the cities, villages and townships represented in the preceding tables was 42,830. The population of the cities, villages and townships represented (estimated) was 3,607,389, which is equal to an annual death rate of 11.87 per thousand living population represented.

The deaths in 3,470,906 living population (estimated) in 1905, were 37,723, equal to an annual death rate of 10.87 per thousand; while in 1904 the total number of deaths reported in 3,230,068 population was 41,338, equal to a mortality rate of 12.80 per thousand.

## DEATHS OF CHILDREN UNDER FIVE YEARS OF AGE.

The number of deaths reported of children under five years of age (premature and still born excluded) was 8,600, which is equal to 20.07 per cent. of the deaths from all causes, and a death rate of 2.4 per thousand population represented. The death rate of children under five the preceding year was 1.8 per thousand population represented.

## GENERAL DISEASES.

The total number of deaths reported from general diseases was 12,154 which is equal to 28.4 per cent. of the deaths reported from all causes, and an annual rate of 3.4 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 10,946, equal to a mortality rate of 3.2 per thousand of the population represented.

## CROUP AND DIPHTHERIA.

The total number of deaths reported from croup and diphtheria was 774, which is equal to 1.8 per cent. of the deaths reported from all causes, and a death rate of .21 per thousand of the population represented.

The number of deaths reported the preceding year from these causes was 733, equal to a mortality rate of .21 per thousand of the population represented.

## MEASLES, SCARLET FEVER AND WHOOPING COUGH.

The total number of deaths reported from measles, scarlet fever and whooping cough was 647, which is equal to 1.51 per cent. of the number of deaths reported from all causes, and a mortality rate of .18 per thousand of the population represented.

The total number of deaths reported from these diseases during the preceding year was 383, equal to a mortality rate of .11 per thousand population represented.

#### TYPHOID FEVER.

The total number of deaths reported from typhoid fever was 1,238, which is equal to 2.66 per cent. of the total number reported from all causes, and a mortality rate of .34 per thousand population represented.

The number of deaths reported from this cause the preceding year was 1,253, equal to a mortality rate of .36 per thousand population represented.

#### CANCER.

The total number of deaths reported from cancer was 1,845, which is equal to 4.3 per cent. of the deaths reported from all causes, and a mortality rate of .51 per thousand population represented.

The number of deaths reported from this cause the preceding year was 1,536, equal to a mortality rate of .40 per thousand population represented.

#### PULMONARY TUBERCULOSIS.

The total number of deaths reported from pulmonary tuberculosis was 4,301, which is equal to 10.04 per cent. of the deaths reported from all causes, and a mortality rate of 1.19 per thousand population represented.

The number of deaths reported from this cause the preceding year was 3,935, equal to a mortality rate of 1.1 per thousand population represented.

#### DISEASES OF THE NERVOUS SYSTEM.

The total number of deaths reported from diseases of the nervous system was 4,970, which is equal to 11.6 per cent. of the deaths reported from all causes, and a mortality rate of 1.4 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 4,213, equal to a mortality rate of 1.2 per thousand population represented.

#### DISEASES OF THE CIRCULATORY SYSTEM.

The total number of deaths reported from diseases of the circulatory system was 4,163, which is equal to 9.7 per cent. of the deaths reported from all causes, and a mortality rate of 1.15 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 3,595, equal to a mortality rate of 1.04 per thousand population represented.

#### DISEASES OF THE RESPIRATORY SYSTEM.

The total number of deaths reported from diseases of the respiratory system was 4,970, which is equal to 11.6 per cent. of the deaths reported

from all causes, and a mortality rate of 1.29 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 4,588, equal to a mortality rate of 1.3 per thousand population represented.

#### DISEASES OF THE DIGESTIVE SYSTEM.

The total number of deaths reported from diseases of the digestive system was 4,643, which is equal to 10.8 per cent. of the deaths reported from all causes, and a mortality rate of 1.20 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 3,631, equal to a mortality rate of .97 per thousand population represented.

#### DISEASES OF GENITO-URINARY SYSTEM.

The total number of deaths reported from diseases of the genito-urinary system was 2,474, which is equal to 5.8 per cent. of the deaths from all causes, and a mortality rate of .68 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 2,099, equal to a mortality rate of .56 per thousand population represented.

#### PUERPERAL CONDITIONS.

The total number of deaths reported from puerperal conditions was 386, which is equal to .90 per cent. of the deaths reported from all causes, and a mortality rate of .11 per thousand population represented.

The number of deaths reported the preceding year from these causes was 365, equal to a mortality rate of .1 per thousand population represented.

#### DISEASES OF THE SKIN AND CELLULAR TISSUE.

The total number of deaths reported from diseases of the skin and cellular tissue was 127, which is equal to .27 per cent. of the deaths reported from all causes, and a mortality rate of .03 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 128, equal to a mortality rate of .03 per thousand population represented.

#### DISEASES OF ORGANS OF LOCOMOTION.

The total number of deaths reported from diseases of the organs of locomotion was 141, which is equal to .33 per cent. of the deaths reported from all causes, and a mortality rate of .038 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 102, equal to a mortality rate of .03 per thousand population represented.



## MALFORMATIONS.

The total number of deaths reported from malformations was 137, which is equal to .32 per cent. of the deaths reported from all causes, and a mortality rate of .038 per thousand population represented.

The number of deaths reported the preceding year from these causes was 136, equal to a mortality rate of .036 per thousand population represented.

## INFANTILE DISEASES.

The total number of deaths reported from infantile diseases was 1,505, which is equal to 3.51 per cent. of the deaths reported from all causes, and a mortality rate of .42 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 1,501, equal to a mortality rate of .4 per thousand population represented.

## OLD AGE.

The total number of deaths reported from old age was 2,436, which is equal to 5.69 per cent. of the deaths reported from all causes, and an annual rate of .68 per thousand population represented.

The number of deaths reported the preceding year from this cause was 2,465, equal to a mortality rate of .65 per thousand population represented.

## VIOLENCE.

The total number of deaths from violence was 2,493, which is equal to 5.82 per cent. of the deaths reported from all causes, and a mortality rate of .69 per thousand population represented.

During the preceding year there were 2,596 deaths reported from violence, equal to a mortality rate of .69 per thousand population represented.

## ILL-DEFINED DISEASES.

The total number of deaths reported from ill-defined diseases was 1,403, which is equal to 3.28 per cent. of the deaths reported from all causes, and a mortality rate of .39 per thousand population represented.

The number of deaths reported the preceding year from these diseases was 1,070, equal to a mortality rate of .28 per thousand population represented.

## PREMATURE AND STILL BIRTHS.

The total number of premature and still births reported was 2,348, which is equal to 5.54 per cent. of the deaths reported from all causes, and a rate of .65 per thousand population represented.

During the preceding year there were 1,975 premature and still births reported, equal to a rate of .53 per thousand population represented.



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